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UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS DECANA DE AMÉRICA

FACULTAD DE INGENIERÍA ELECTRÓNICA Y ELÉCTRICA

REDES DE DATOS I

PROFESOR

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ALUMNO

Condor Espinoza Daniel Steven

Lima - Perú

SEPTIEMBRE-2020

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Enrutamiento Dinámico OSPFv2

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Facultad de Ingeniería Electrónica, Eléctrica y de Telecomunicaciones

UNMSM – 2020

I. OBJETIVOS

A. Usar el Software Cisco Packet Tracer o GNS3 para configurar un router Cisco.

B. Emplear el protocolo de enrutamiento dinámico OSPGv2 en redes WAN.

II. HERRAMIENTAS

A. Cisco Packet Tracer o GNS3.

III. PROCEDIMIENTO

A. Implemente la topología de la Fig. 1, en la que se simulará la interconexión de redes corporativas empleado el enrutamiento dinámico OSPFv2, con área 0.

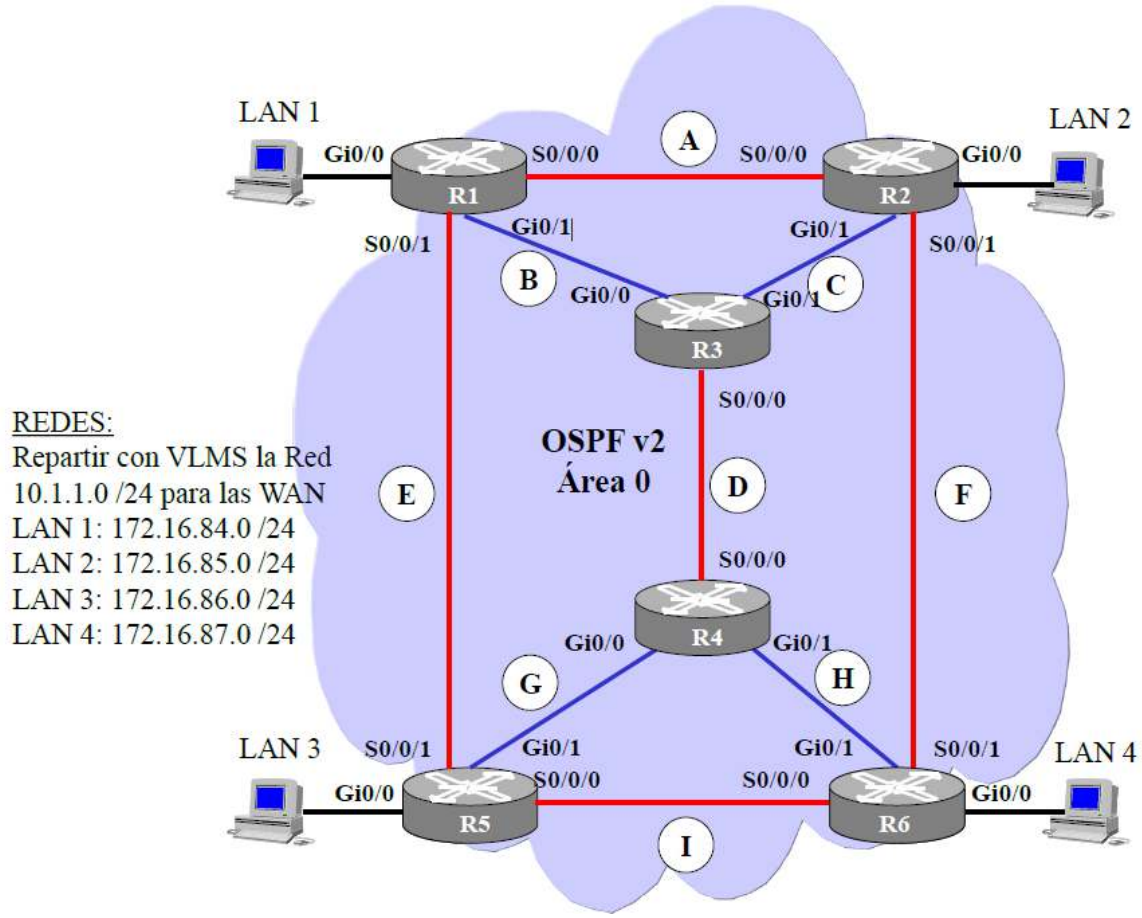

Fig. 1 Topología de la red a implementar en Cisco Packet Tracer.

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Primero se repartió las direcciones de red y direcciones IP de cada red WAN usando la técnica de VLMS, para las 9 WAN que se presentan en la figura 1.

En la siguiente tabla observaremos para cada red WAN su dirección de red, dirección de broadcast, máscara de subred y las respectivas direcciones asignables.

Tabla 1 Direcciones para cada WAN

WAN	Dirección de red	Máscara	1era Dirección asignable	Última dirección asignable	Dirección de broadcast
A	10.1.1.0/30	255.255.255.252	10.1.1.1	10.1.1.2	10.1.1.3
B	10.1.1.4/30	255.255.255.252	10.1.1.5	10.1.1.6	10.1.1.7
C	10.1.1.8/30	255.255.255.252	10.1.1.9	10.1.1.10	10.1.1.11
D	10.1.1.12/30	255.255.255.252	10.1.1.13	10.1.1.14	10.1.1.15
E	10.1.1.16/30	255.255.255.252	10.1.1.17	10.1.1.18	10.1.1.19
F	10.1.1.20/30	255.255.255.252	10.1.1.21	10.1.1.22	10.1.1.23
G	10.1.1.24/30	255.255.255.252	10.1.1.25	10.1.1.26	10.1.1.27
H	10.1.1.28/30	255.255.255.252	10.1.1.29	10.1.1.30	10.1.1.31
I	10.1.1.32/30	255.255.255.252	10.1.1.33	10.1.1.34	10.1.1.35

Las direcciones para las 4 redes LAN ya fueron dadas previamente, estas direcciones se pueden ver en la tabla 2.

Tabla 2 Dirección para cada LAN.

LAN	Dirección de red	Máscara	1era Dirección asignable
1	172.16.84.0	255.255.255.0	172.16.84.1
2	172.16.85.0	255.255.255.0	172.16.85.1
3	172.16.86.0	255.255.255.0	172.16.86.1
4	172.16.87.0	255.255.255.0	172.16.87.1

Una vez definido todas las direcciones que corresponderán tanto a las PCs como a los routers, se implementa la topología de la figura 1 en el software Packet Tracer, y después configurar a cada router y cada PC con las direcciones asignables.

La figura 2 muestra esta topología realizada en Packet Tracer con etiquetas que identifican las direcciones de las redes LAN y redes WAN.

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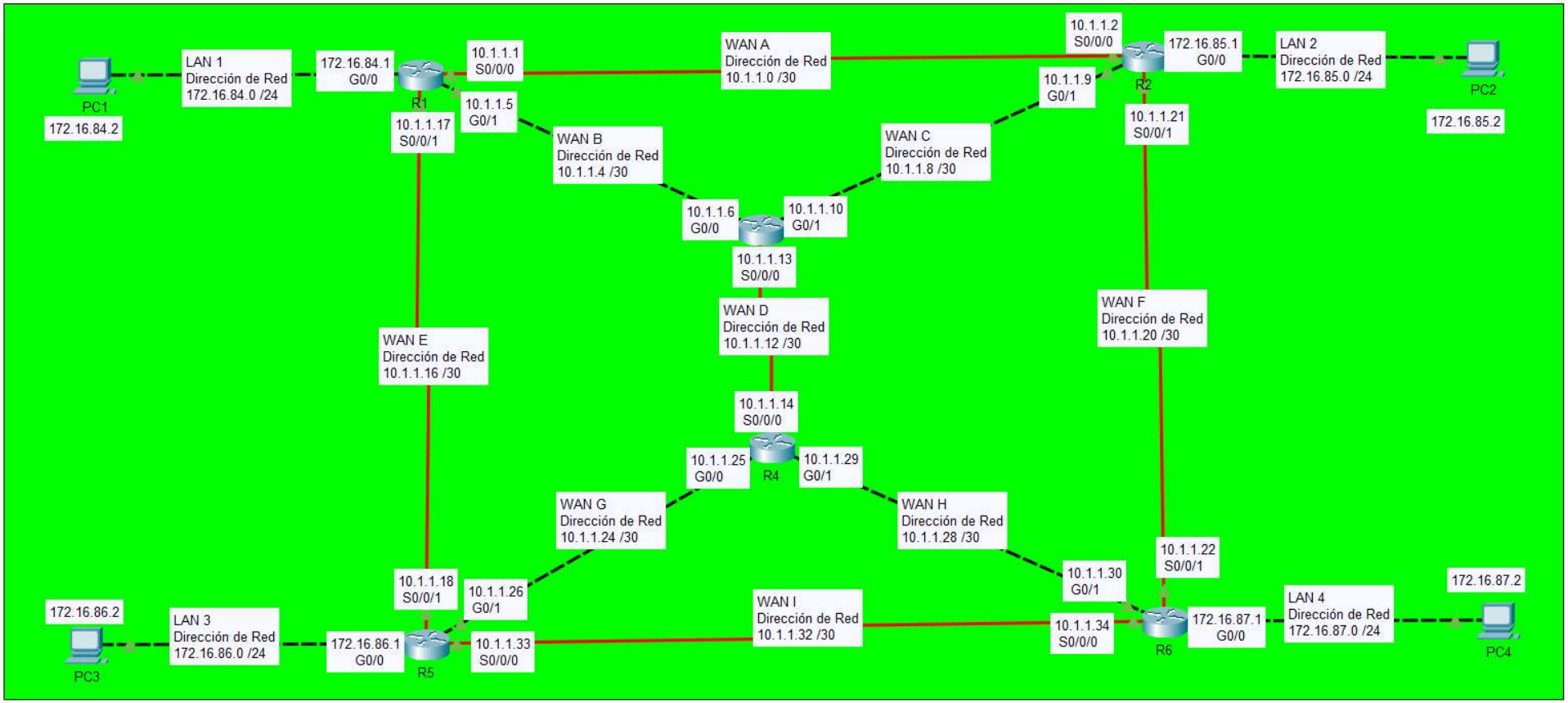

Fig. 2 Topología de la red implementada en Cisco Packet Tracer (área 0).

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B. Verifique e interprete la configuración de cada router, con el comando sh run.

Lo que se realizó en esta sección fue usar el comando sh run en cada router, la información relevante que se obtuvo y que se configuró se muestra a través de este código.

En la figura 3 se aplicó el comando sh run en el Router 1, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 1, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a las interfaces Serial0/0/0 y Serial0/0/1. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.0, 10.1.1.4 y 10.1.1.16, la red LAN 1 172.16.84.0, y la red loopback 10.10.10.10.

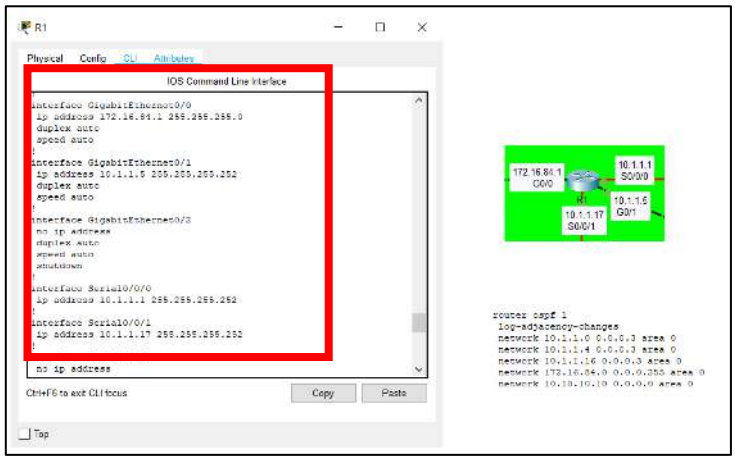

Fig. 3 "SH RUN" del Router 1.

En la figura 4 se aplicó el comando sh run en el Router 2, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 2, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a las interfaces Serial0/0/0 y Serial0/0/1. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.0, 10.1.1.8 y 10.1.1.20, la red LAN 1 172.16.85.0, y la red loopback 10.10.20.10.

Fig. 4 "SH RUN" del Router 2.

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En la figura 5 se aplicó el comando sh run en el Router 3, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 3, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a la interfaz Serial0/0/0. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.4, 10.1.1.8 y 10.1.1.12, y la red loopback 10.10.30.10.

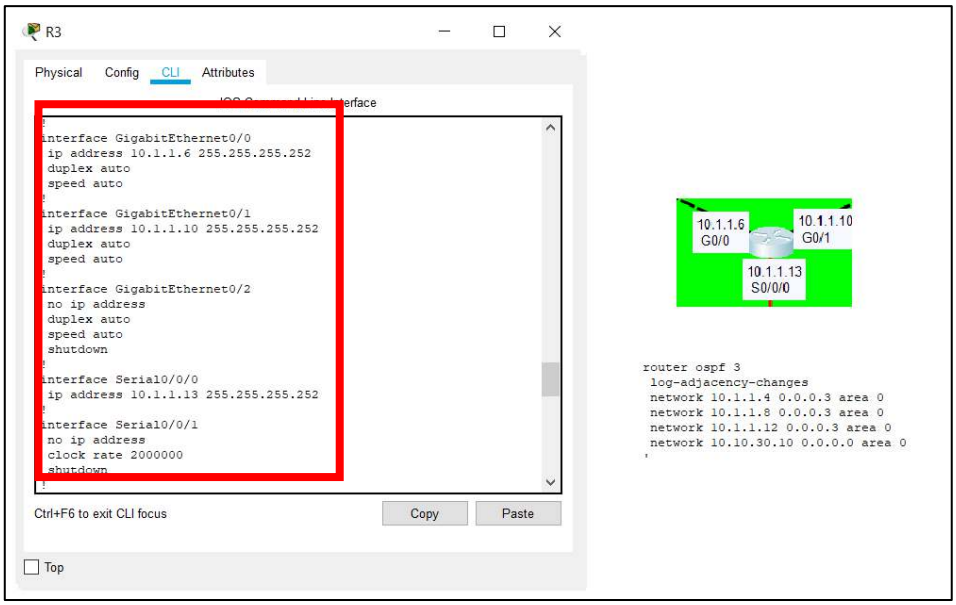

Fig. 5 "SH RUN" del Router 3.

En la figura 6 se aplicó el comando sh run en el Router 4, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 4, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a la interfaz Serial0/0/0. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.12, 10.1.1.24 y 10.1.1.28, y la red loopback 10.10.40.10.

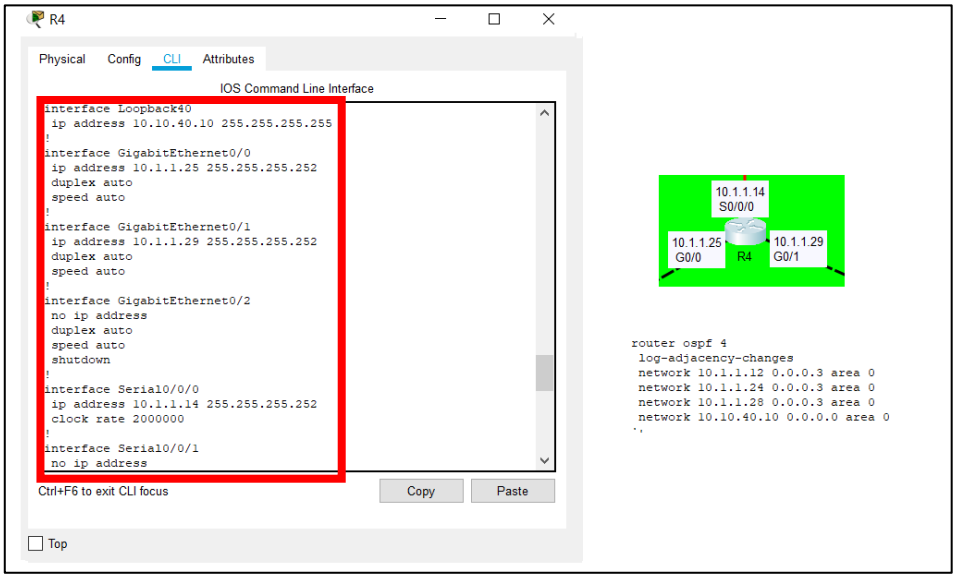

Fig. 6 "SH RUN" del Router 4.

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En la figura 7 se aplicó el comando sh run en el Router 5, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 5, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a las interfaces Serial0/0/0 y Serial0/0/1. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.16, 10.1.1.24 y 10.1.1.32, la red LAN 1 172.16.86.0, y la red loopback 10.10.50.10.

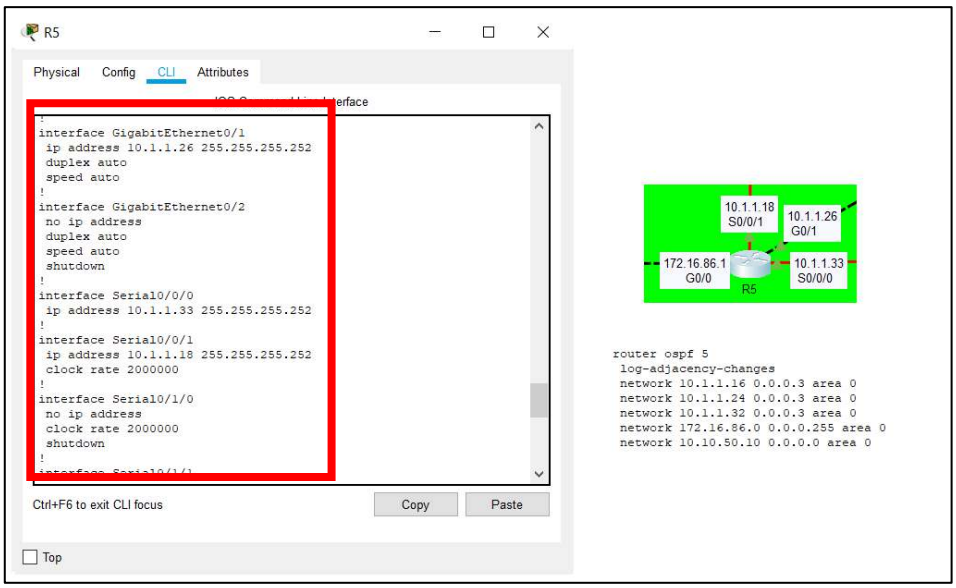

Fig. 7 "SH RUN" del Router 5.

En la figura 8 se aplicó el comando sh run en el Router 6, en dónde podemos observar todas las interfaces a los que está directamente conectado el router 6, en este caso está conectado a la interfaz GigabitEthernet0/0 y GigabitEthernet0/1, y a las interfaces Serial0/0/0 y Serial0/0/1. A cada una de estas interfaces le corresponde una dirección IP.

También se observa el enrutamiento dinámico OSPF v2 que se configuró previamente, y esta identifica las redes WAN 10.1.1.20, 10.1.1.28 y 10.1.1.32, la red LAN 1 172.16.87.0, y la red loopback 10.10.60.10.

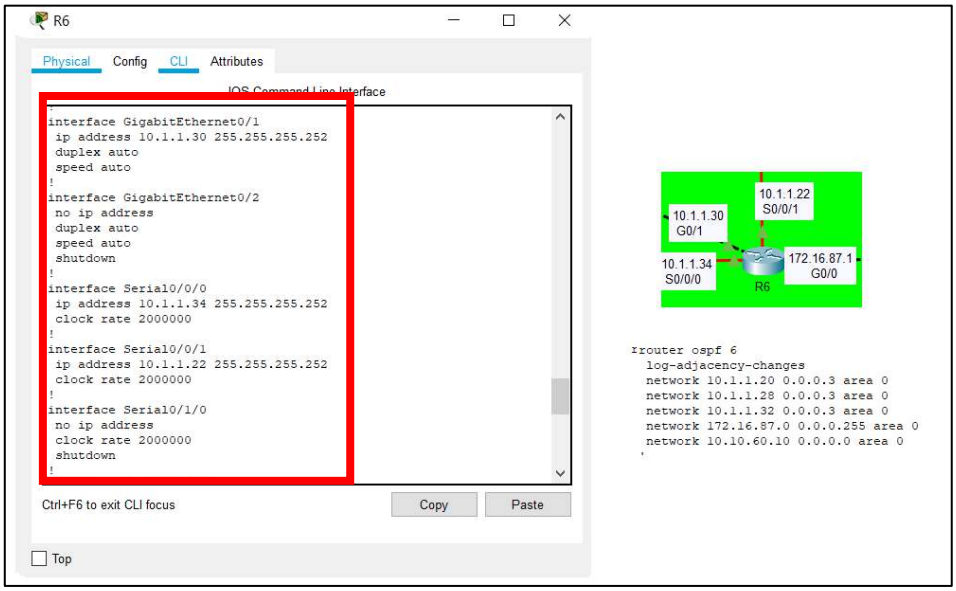

Fig. 8 "SH RUN" del Router 6.

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C. Verifique e interprete las tablas de enrutamiento con el ***comando sh ip route.***

En esta sección se hizo uso del comando sh ip route para ver la tabla de todas las rutas que realiza cada router.

A continuación, se muestra lo que se obtiene cuando se hace uso de este comando para el Router 1:

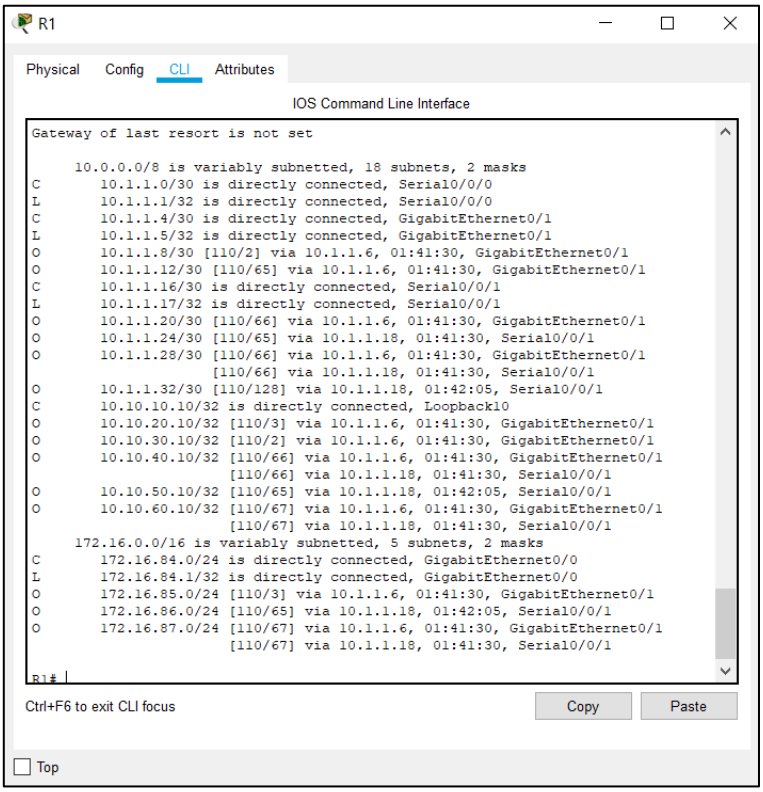
R1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
C 10.1.1.0/30 is directly connected, Serial0/0/0
L 10.1.1.1/32 is directly connected, Serial0/0/0
C 10.1.1.4/30 is directly connected, GigabitEthernet0/1
L 10.1.1.5/32 is directly connected, GigabitEthernet0/1
O 10.1.1.8/30 [110/2] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
O 10.1.1.12/30 [110/65] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
C 10.1.1.16/30 is directly connected, Serial0/0/1
L 10.1.1.17/32 is directly connected, Serial0/0/1
O 10.1.1.20/30 [110/66] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
O 10.1.1.24/30 [110/65] via 10.1.1.18, 01:41:30, Serial0/0/1
O 10.1.1.28/30 [110/66] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
[110/66] via 10.1.1.18, 01:41:30, Serial0/0/1
O 10.1.1.32/30 [110/128] via 10.1.1.18, 01:42:05, Serial0/0/1
C 10.10.10.10/32 is directly connected, Loopback10
O 10.10.20.10/32 [110/3] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
O 10.10.30.10/32 [110/2] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
O 10.10.40.10/32 [110/66] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
[110/66] via 10.1.1.18, 01:41:30, Serial0/0/1
O 10.10.50.10/32 [110/65] via 10.1.1.18, 01:42:05, Serial0/0/1
O 10.10.60.10/32 [110/67] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
[110/67] via 10.1.1.18, 01:41:30, Serial0/0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
C 172.16.84.0/24 is directly connected, GigabitEthernet0/0
L 172.16.84.1/32 is directly connected, GigabitEthernet0/0
O 172.16.85.0/24 [110/3] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
O 172.16.86.0/24 [110/65] via 10.1.1.18, 01:42:05, Serial0/0/1
O 172.16.87.0/24 [110/67] via 10.1.1.6, 01:41:30, GigabitEthernet0/1
[110/67] via 10.1.1.18, 01:41:30, Serial0/0/1
R1#
Ctrl+F6 to exit CLI focus
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Fig. 9 "SH IP ROUTE" para el Router 1.

A continuación, se explica lo que se obtiene con este comando al ser aplicado al router 1:

En la tabla se muestra determinados prefijos, los cuales se explicará:

- El prefijo C indica que se trata de una ruta correspondiente a una red directamente conectada. El router 1 está directamente conectada con:

Tabla 3 Prefijo C Router 1.

C	10.1.1.0/30 está directamente conectada, Serial0/0/0
C	10.1.1.4/30 está directamente conectada, GigabitEthernet0/1
C	10.1.1.16/30 está directamente conectada, Serial0/0/1
C	10.10.10.10/32 está directamente conectada, Loopback2
C	172.16.84.0/24 está directamente conectada, GigabitEthernet0/0

- El prefijo L indica la dirección IP local de router en esa red, además, en la siguiente tabla se indica a que interfaz pertenecen:

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Tabla 4 Prefijo L Router 1.

L	10.1.1.0/32 está directamente conectada, Serial0/0/0
L	10.1.1.5/32 está directamente conectada, GigabitEthernet0/1
L	10.1.1.17/32 está directamente conectada, Serial0/0/1
L	172.16.84.1/32 está directamente conectada, GigabitEthernet0/0

- El prefijo O indica las rutas dinámicas, se especifica un poco la distancia administrativa o el costo que se requiere para llegar a una determinada WAN, indica la vía a la que ingresa para llegar a la WAN que antes se describe, la interfaz de la vía y también cabe recalcar, que si hubieran 2 o más rutas que tuvieran la misma distancia administrativa, entonces se pondrán todas esas rutas con lo que se indica que pueden ser las rutas a elegir teniendo en cuenta el menor costo (ruta corta).

Tabla 5 Prefijo O Router 1.

O	10.1.1.8/30 [110/2] vía 10.1.1.6, 02:03:34, GigabitEthernet0/1
O	10.1.1.12/30 [110/65] vía 10.1.1.6, 02:03:34, GigabitEthernet0/1
O	10.1.1.20/30 [110/65] vía 10.1.1.6, 02:03:34, GigabitEthernet0/1
O	10.1.1.24/30 [110/65] vía 10.1.1.18, 02:03:34, Serial0/0/1
O	10.1.1.28/30 [110/66] vía 10.1.1.6, 02:03:34, GigabitEthernet0/1
	[110/66] vía 10.1.1.18, 02:03:34, Serial0/0/1
O	10.1.1.24/30 [110/65] vía 10.1.1.18, 02:03:34, Serial0/0/1
O	10.10.20.10/32 [110/3] via 10.1.1.6, 02:03:34, GigabitEthernet0/1
O	10.10.40.10/32 [110/66] via 10.1.1.6, 02:03:34, GigabitEthernet0/1
	[110/66] via 10.1.1.18, 02:03:34, Serial0/0/1
O	10.10.50.10/32 [110/65] via 10.1.1.18, 02:04:04, Serial0/0/1
O	10.10.60.10/32 [110/67] via 10.1.1.6, 02:03:34, GigabitEthernet0/1
	[110/67] via 10.1.1.18, 02:03:34, Serial0/0/1
O	172.16.85.0/24 [110/3] via 10.1.1.6, 02:03:34, GigabitEthernet0/1
O	172.16.86.0/24 [110/65] via 10.1.1.18, 02:04:04, Serial0/0/1
O	172.16.87.0/24 [110/67] via 10.1.1.6, 02:03:34, GigabitEthernet0/1
	[110/67] via 10.1.1.18, 02:03:34, Serial0/0/1

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De la misma forma que la explicación dada anteriormente se muestra todo el routing que van a llevar a cabo cada uno de los Routers.

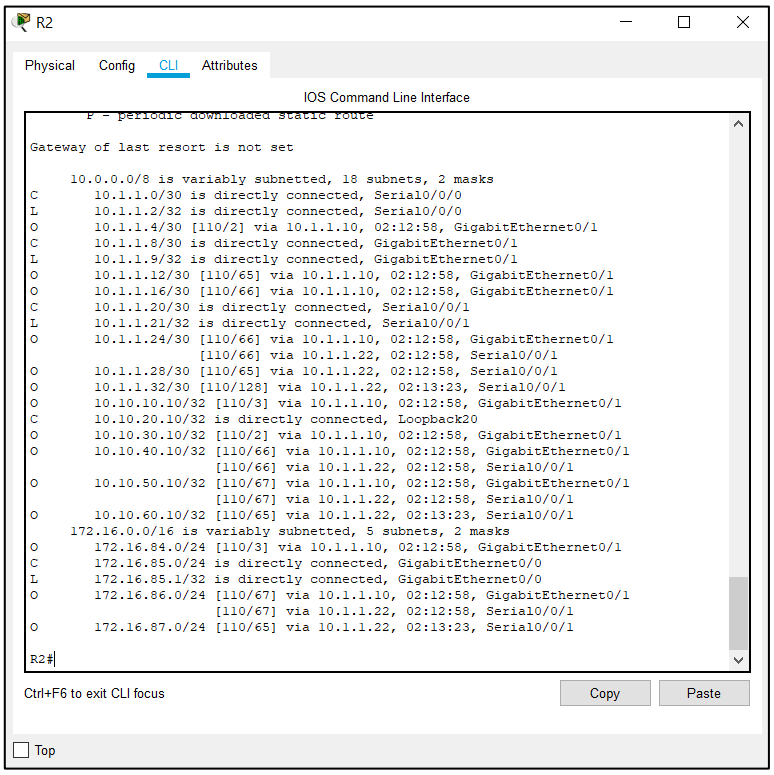
R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
C 10.1.1.0/30 is directly connected, Serial0/0/0
L 10.1.1.2/32 is directly connected, Serial0/0/0
O 10.1.1.4/30 [110/2] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
C 10.1.1.8/30 is directly connected, GigabitEthernet0/1
L 10.1.1.9/32 is directly connected, GigabitEthernet0/1
O 10.1.1.12/30 [110/65] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
O 10.1.1.16/30 [110/66] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
C 10.1.1.20/30 is directly connected, Serial0/0/1
L 10.1.1.21/32 is directly connected, Serial0/0/1
O 10.1.1.24/30 [110/66] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
[110/66] via 10.1.1.22, 02:12:58, Serial0/0/1
O 10.1.1.28/30 [110/65] via 10.1.1.22, 02:12:58, Serial0/0/1
O 10.1.1.32/30 [110/128] via 10.1.1.22, 02:13:23, Serial0/0/1
O 10.10.10.10/32 [110/3] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
C 10.10.20.10/32 is directly connected, Loopback20
O 10.10.30.10/32 [110/2] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
O 10.10.40.10/32 [110/66] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
[110/66] via 10.1.1.22, 02:12:58, Serial0/0/1
O 10.10.50.10/32 [110/67] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
[110/67] via 10.1.1.22, 02:12:58, Serial0/0/1
O 10.10.60.10/32 [110/65] via 10.1.1.22, 02:13:23, Serial0/0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O 172.16.84.0/24 [110/3] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
C 172.16.85.0/24 is directly connected, GigabitEthernet0/0
L 172.16.85.1/32 is directly connected, GigabitEthernet0/0
O 172.16.86.0/24 [110/67] via 10.1.1.10, 02:12:58, GigabitEthernet0/1
[110/67] via 10.1.1.22, 02:12:58, Serial0/0/1
O 172.16.87.0/24 [110/65] via 10.1.1.22, 02:13:23, Serial0/0/1
R2#
Ctrl+F6 to exit CLI focus
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Fig. 10 "SH IP ROUTE" para el Router 2.

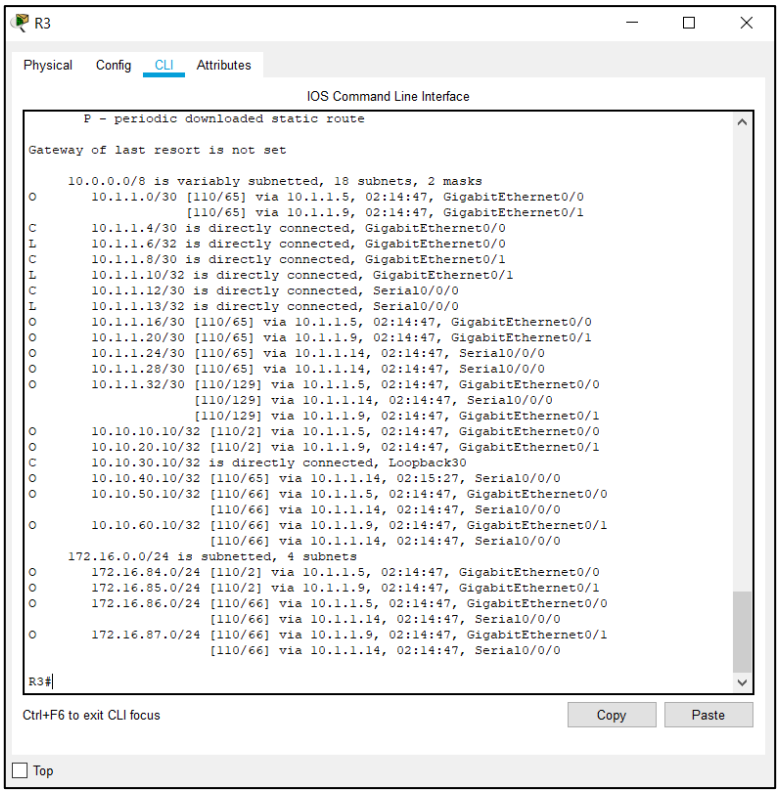
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
O 10.1.1.0/30 [110/65] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
[110/65] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
C 10.1.1.4/30 is directly connected, GigabitEthernet0/0
L 10.1.1.6/32 is directly connected, GigabitEthernet0/0
C 10.1.1.8/30 is directly connected, GigabitEthernet0/1
L 10.1.1.10/32 is directly connected, GigabitEthernet0/1
C 10.1.1.12/30 is directly connected, Serial0/0/0
L 10.1.1.13/32 is directly connected, Serial0/0/0
O 10.1.1.16/30 [110/65] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
O 10.1.1.20/30 [110/65] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
O 10.1.1.24/30 [110/65] via 10.1.1.14, 02:14:47, Serial0/0/0
O 10.1.1.28/30 [110/65] via 10.1.1.14, 02:14:47, Serial0/0/0
O 10.1.1.32/30 [110/129] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
[110/129] via 10.1.1.14, 02:14:47, Serial0/0/0
[110/129] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
O 10.10.10.10/32 [110/2] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
O 10.10.20.10/32 [110/2] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
C 10.10.30.10/32 is directly connected, Loopback30
O 10.10.40.10/32 [110/65] via 10.1.1.14, 02:15:27, Serial0/0/0
O 10.10.50.10/32 [110/66] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
[110/66] via 10.1.1.14, 02:14:47, Serial0/0/0
O 10.10.60.10/32 [110/66] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
[110/66] via 10.1.1.14, 02:14:47, Serial0/0/0
172.16.0.0/24 is subnetted, 4 subnets
O 172.16.84.0/24 [110/2] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
O 172.16.85.0/24 [110/2] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
O 172.16.86.0/24 [110/66] via 10.1.1.5, 02:14:47, GigabitEthernet0/0
[110/66] via 10.1.1.14, 02:14:47, Serial0/0/0
O 172.16.87.0/24 [110/66] via 10.1.1.9, 02:14:47, GigabitEthernet0/1
[110/66] via 10.1.1.14, 02:14:47, Serial0/0/0
R3#
Ctrl+F6 to exit CLI focus
Copy
Paste
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Fig. 11 "SH IP ROUTE" para el Router 3.

Descargado por Jose Suyo (xihirel165@gomail5.com)

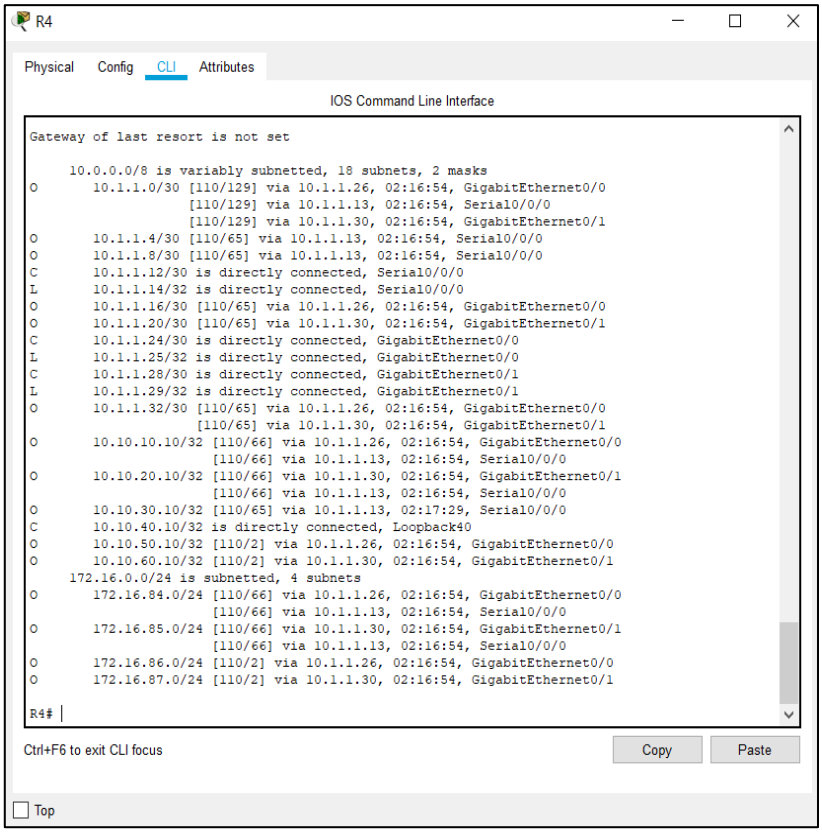
R4
Physical Config CLI Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
O 10.1.1.0/30 [110/129] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
[110/129] via 10.1.1.13, 02:16:54, Serial0/0/0
[110/129] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
O 10.1.1.4/30 [110/65] via 10.1.1.13, 02:16:54, Serial0/0/0
O 10.1.1.8/30 [110/65] via 10.1.1.13, 02:16:54, Serial0/0/0
C 10.1.1.12/30 is directly connected, Serial0/0/0
L 10.1.1.14/32 is directly connected, Serial0/0/0
O 10.1.1.16/30 [110/65] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
O 10.1.1.20/30 [110/65] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
C 10.1.1.24/30 is directly connected, GigabitEthernet0/0
L 10.1.1.25/32 is directly connected, GigabitEthernet0/0
C 10.1.1.28/30 is directly connected, GigabitEthernet0/1
L 10.1.1.29/32 is directly connected, GigabitEthernet0/1
O 10.1.1.32/30 [110/65] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
[110/65] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
O 10.10.10.10/32 [110/66] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
[110/66] via 10.1.1.13, 02:16:54, Serial0/0/0
O 10.10.20.10/32 [110/66] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
[110/66] via 10.1.1.13, 02:16:54, Serial0/0/0
O 10.10.30.10/32 [110/65] via 10.1.1.13, 02:17:29, Serial0/0/0
C 10.10.40.10/32 is directly connected, Loopback40
O 10.10.50.10/32 [110/2] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
O 10.10.60.10/32 [110/2] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
172.16.0.0/24 is subnetted, 4 subnets
O 172.16.84.0/24 [110/66] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
[110/66] via 10.1.1.13, 02:16:54, Serial0/0/0
O 172.16.85.0/24 [110/66] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
[110/66] via 10.1.1.13, 02:16:54, Serial0/0/0
O 172.16.86.0/24 [110/2] via 10.1.1.26, 02:16:54, GigabitEthernet0/0
O 172.16.87.0/24 [110/2] via 10.1.1.30, 02:16:54, GigabitEthernet0/1
R4#
Ctrl+F6 to exit CLI focus
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Fig. 12 "SH IP ROUTE" para el Router 4.

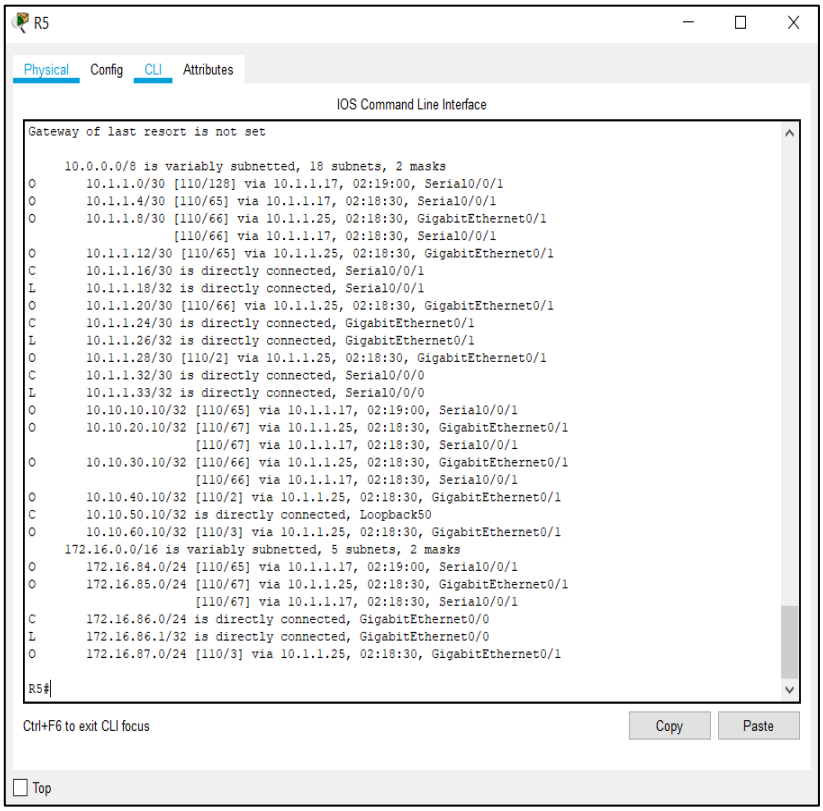
R5
Physical Config CLI Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
O 10.1.1.0/30 [110/128] via 10.1.1.17, 02:19:00, Serial0/0/1
O 10.1.1.4/30 [110/65] via 10.1.1.17, 02:18:30, Serial0/0/1
O 10.1.1.8/30 [110/66] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
[110/66] via 10.1.1.17, 02:18:30, Serial0/0/1
O 10.1.1.12/30 [110/65] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
C 10.1.1.16/30 is directly connected, Serial0/0/1
L 10.1.1.18/32 is directly connected, Serial0/0/1
O 10.1.1.20/30 [110/66] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
C 10.1.1.24/30 is directly connected, GigabitEthernet0/1
L 10.1.1.26/32 is directly connected, GigabitEthernet0/1
O 10.1.1.28/30 [110/2] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
C 10.1.1.32/30 is directly connected, Serial0/0/0
L 10.1.1.33/32 is directly connected, Serial0/0/0
O 10.10.10.10/32 [110/65] via 10.1.1.17, 02:19:00, Serial0/0/1
O 10.10.20.10/32 [110/67] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
[110/67] via 10.1.1.17, 02:18:30, Serial0/0/1
O 10.10.30.10/32 [110/66] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
[110/66] via 10.1.1.17, 02:18:30, Serial0/0/1
O 10.10.40.10/32 [110/2] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
C 10.10.50.10/32 is directly connected, Loopback50
O 10.10.60.10/32 [110/3] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O 172.16.84.0/24 [110/65] via 10.1.1.17, 02:19:00, Serial0/0/1
O 172.16.85.0/24 [110/67] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
[110/67] via 10.1.1.17, 02:18:30, Serial0/0/1
C 172.16.86.0/24 is directly connected, GigabitEthernet0/0
L 172.16.86.1/32 is directly connected, GigabitEthernet0/0
O 172.16.87.0/24 [110/3] via 10.1.1.25, 02:18:30, GigabitEthernet0/1
R5#
Ctrl+F6 to exit CLI focus
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Fig. 13 "SH IP ROUTE" para el Router 5.

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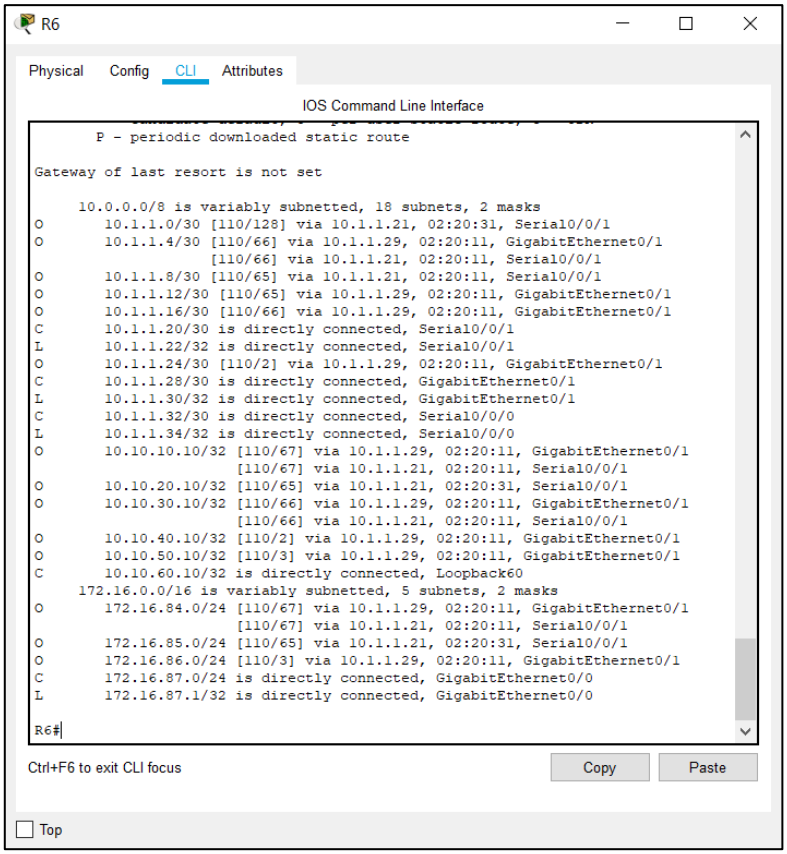
R6
Physical
Config
CLI
Attributes
IOS Command Line Interface
P - periodic downloaded static route
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 18 subnets, 2 masks
O 10.1.1.0/30 [110/128] via 10.1.1.21, 02:20:31, Serial0/0/1
O 10.1.1.4/30 [110/66] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
[110/66] via 10.1.1.21, 02:20:11, Serial0/0/1
O 10.1.1.8/30 [110/65] via 10.1.1.21, 02:20:11, Serial0/0/1
O 10.1.1.12/30 [110/65] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
O 10.1.1.16/30 [110/66] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
C 10.1.1.20/30 is directly connected, Serial0/0/1
L 10.1.1.22/32 is directly connected, Serial0/0/1
O 10.1.1.24/30 [110/2] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
C 10.1.1.28/30 is directly connected, GigabitEthernet0/1
L 10.1.1.30/32 is directly connected, GigabitEthernet0/1
C 10.1.1.32/30 is directly connected, Serial0/0/0
L 10.1.1.34/32 is directly connected, Serial0/0/0
O 10.10.10.10/32 [110/67] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
[110/67] via 10.1.1.21, 02:20:11, Serial0/0/1
O 10.10.20.10/32 [110/65] via 10.1.1.21, 02:20:31, Serial0/0/1
O 10.10.30.10/32 [110/66] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
[110/66] via 10.1.1.21, 02:20:11, Serial0/0/1
O 10.10.40.10/32 [110/2] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
O 10.10.50.10/32 [110/3] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
C 10.10.60.10/32 is directly connected, Loopback60
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O 172.16.84.0/24 [110/67] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
[110/67] via 10.1.1.21, 02:20:11, Serial0/0/1
O 172.16.85.0/24 [110/65] via 10.1.1.21, 02:20:31, Serial0/0/1
O 172.16.86.0/24 [110/3] via 10.1.1.29, 02:20:11, GigabitEthernet0/1
C 172.16.87.0/24 is directly connected, GigabitEthernet0/0
L 172.16.87.1/32 is directly connected, GigabitEthernet0/0
R6#
Ctrl+F6 to exit CLI focus
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Paste
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Fig. 14 "SH IP ROUTE" para el Router 6.

*D. Verifique la conectividad con el comando **ping** entre las redes LAN.*

Vamos a verificar la conectividad entre las redes LAN 1 y LAN 4. Para lograr esto vamos a abrir la ventana de comandos de la PC 1 con dirección IP 172.16.84.2 y enviaremos 4 paquetes de 32 bytes usando el comando ping a la PC 4 con dirección IP 172.16.87.2.

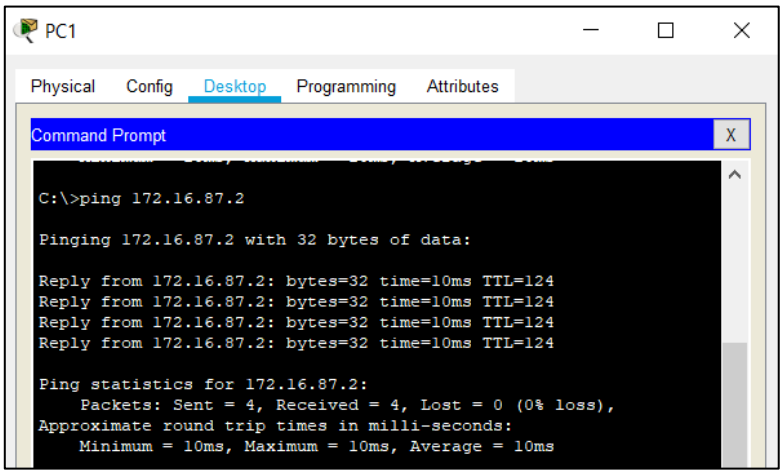
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms

Fig. 15 Ping desde la PC1 a la PC4.

En la siguiente imagen se muestra el envió de uno de los 4 paquetes, y muestra que durante el envió realiza la siguiente ruta.

- La PC 1 envía el paquete al router 1.
- El router 1 envía el paquete al router 3.

Descargado por Jose Suyo (xihirel165@gomail5.com)

- El router 3 envía el paquete al router 2.
- El router 2 envía el paquete a la router 6.
- El router 6 envía el paquete a la PC 4.

Para la respuesta la ruta es de la siguiente manera:

- La PC 4 envía el paquete al router 6.
- El router 6 envía el paquete al router 2.
- El router 2 envía el paquete al router 3.
- El router 3 envía el paquete al router 1.
- El router 1 envía el paquete a la PC 1.

Time(sec)	Last Device	At Device	Type
0.000	--	PC1	ICMP
0.001	PC1	R1	ICMP
0.002	R1	R3	ICMP
0.003	R3	R2	ICMP
0.004	R2	R6	ICMP
0.005	R6	PC4	ICMP
0.006	PC4	R6	ICMP
0.007	R6	R2	ICMP
0.008	R2	R3	ICMP
0.009	R3	R1	ICMP
0.010	R1	PC1	ICMP

Fig. 16 Ruta del paquete de PC 1 a PC 4.

En la figura 17 se observa que las flechas azules indican el request y las flechas rojas indican el reply, y se muestran la ruta que describe el paquete.

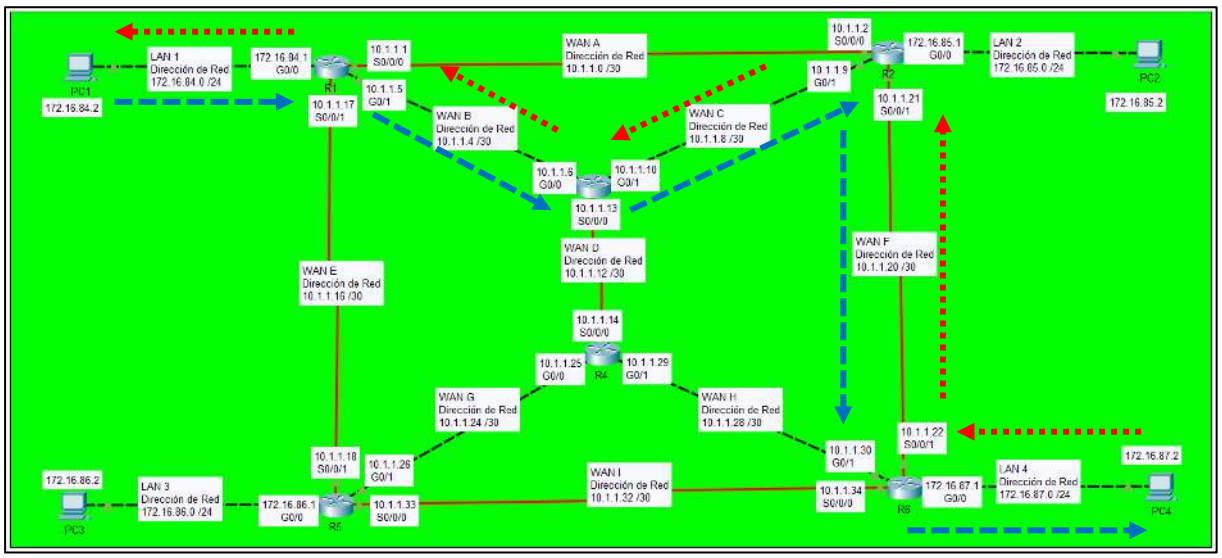

Fig. 17 Ruta que describe el paquete.

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De igual manera se cumplirá cuando se hace ping desde una LAN a otra, a continuación, se muestra la ejecución de este comando de la PC 1 a las PC 2 y 3.
En la figura 18 se ejecutó el comando ping para enviar un paquete desde la PC 1 a la PC 2, se muestra en la ventana de simulación de packet tracer esta ruta.

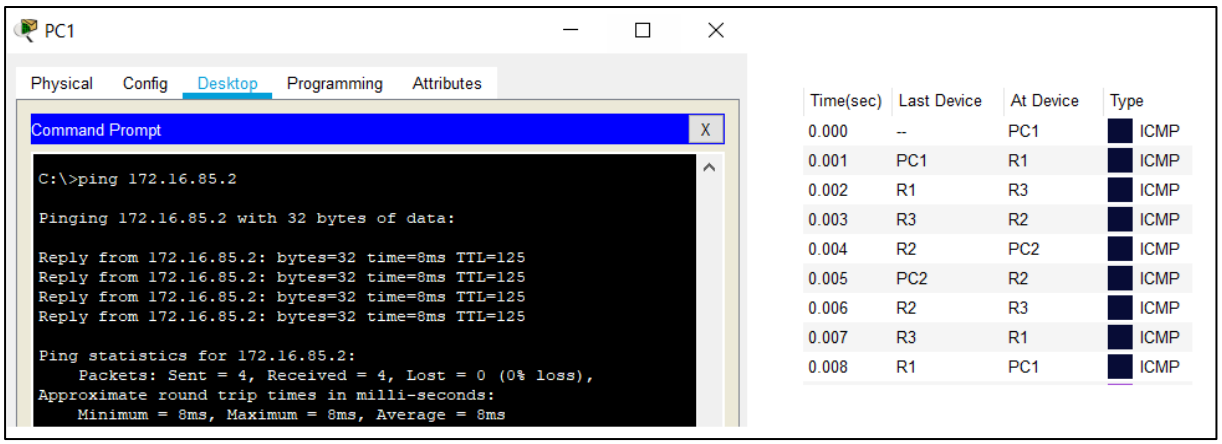
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 172.16.85.2
Pinging 172.16.85.2 with 32 bytes of data:
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Ping statistics for 172.16.85.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 8ms, Maximum = 8ms, Average = 8ms
Time(sec) Last Device At Device Type
0.000 -- PC1 ICMP
0.001 PC1 R1 ICMP
0.002 R1 R3 ICMP
0.003 R3 R2 ICMP
0.004 R2 PC2 ICMP
0.005 PC2 R2 ICMP
0.006 R2 R3 ICMP
0.007 R3 R1 ICMP
0.008 R1 PC1 ICMP

Fig. 18 Enviar paquete desde PC 1 a PC 2.

En la figura 19 se ejecutó el comando ping para enviar un paquete desde la PC 1 a la PC 3, se muestra en la ventana de simulación de packet tracer esta ruta.

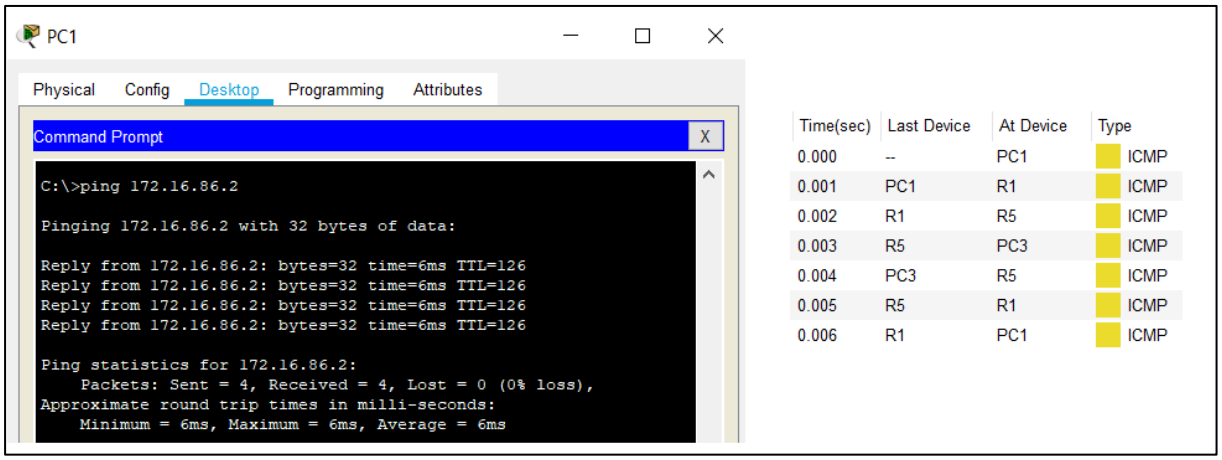
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 172.16.86.2
Pinging 172.16.86.2 with 32 bytes of data:
Reply from 172.16.86.2: bytes=32 time=6ms TTL=126
Reply from 172.16.86.2: bytes=32 time=6ms TTL=126
Reply from 172.16.86.2: bytes=32 time=6ms TTL=126
Reply from 172.16.86.2: bytes=32 time=6ms TTL=126
Ping statistics for 172.16.86.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 6ms, Maximum = 6ms, Average = 6ms
Time(sec) Last Device At Device Type
0.000 -- PC1 ICMP
0.001 PC1 R1 ICMP
0.002 R1 R5 ICMP
0.003 R5 PC3 ICMP
0.004 PC3 R5 ICMP
0.005 R5 R1 ICMP
0.006 R1 PC1 ICMP

Fig. 19 Enviar paquete desde PC 1 a PC 3.

Ahora ejecutamos el comando ping en la PC 2 hacia la PC 3 y PC 4.
En la figura 20 se ejecutó el comando ping para enviar un paquete desde la PC 2 a la PC 3, se muestra en la ventana de simulación de packet tracer esta ruta.

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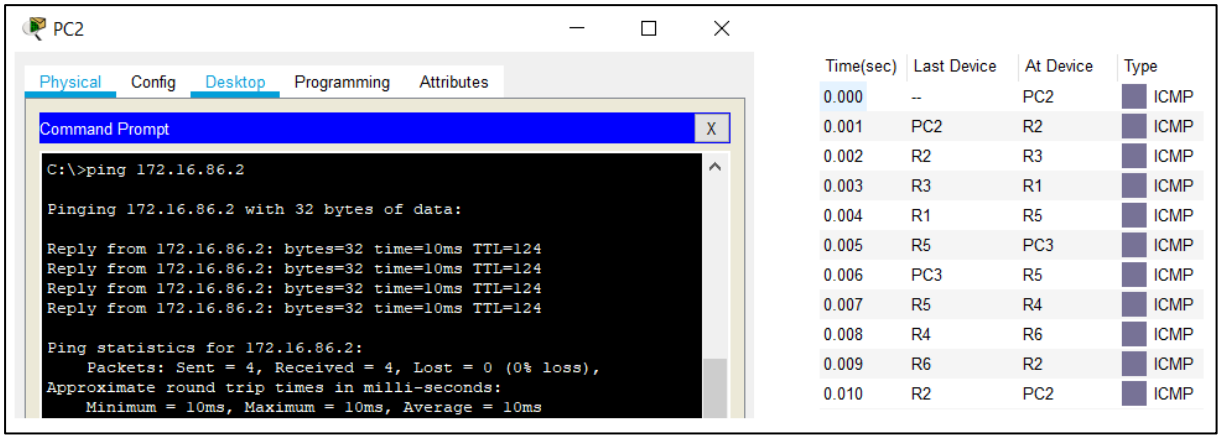
PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.86.2
Pinging 172.16.86.2 with 32 bytes of data:
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.86.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms
Time(sec) Last Device At Device Type
0.000 -- PC2 ICMP
0.001 PC2 R2 ICMP
0.002 R2 R3 ICMP
0.003 R3 R1 ICMP
0.004 R1 R5 ICMP
0.005 R5 PC3 ICMP
0.006 PC3 R5 ICMP
0.007 R5 R4 ICMP
0.008 R4 R6 ICMP
0.009 R6 R2 ICMP
0.010 R2 PC2 ICMP

Fig. 20 Enviar paquete desde PC 2 a PC 3.

En la figura 21 se ejecutó el comando ping para enviar un paquete desde la PC 2 a la PC 4, se muestra en la ventana de simulación de packet tracer esta ruta.

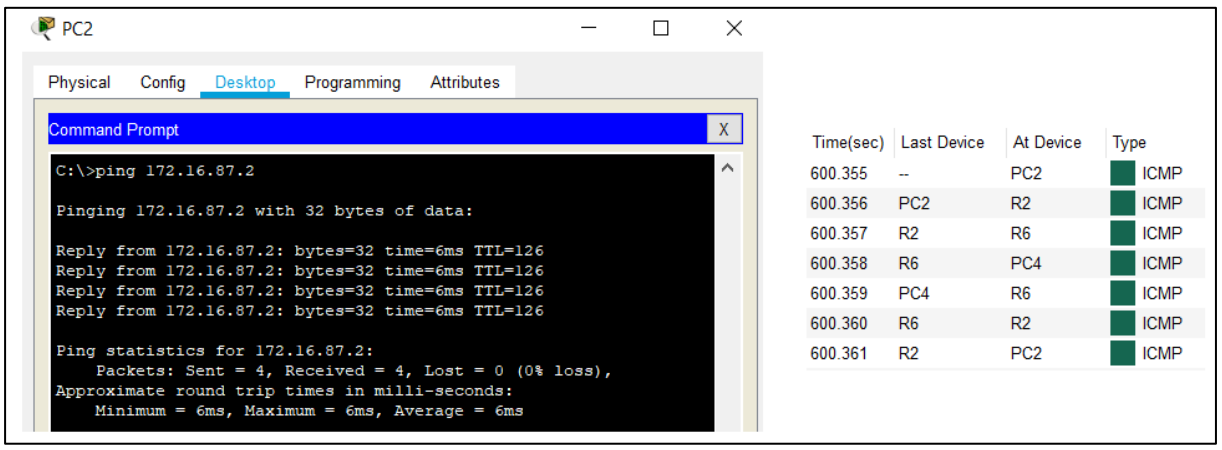
PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=6ms TTL=126
Reply from 172.16.87.2: bytes=32 time=6ms TTL=126
Reply from 172.16.87.2: bytes=32 time=6ms TTL=126
Reply from 172.16.87.2: bytes=32 time=6ms TTL=126
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 6ms, Maximum = 6ms, Average = 6ms
Time(sec) Last Device At Device Type
600.355 -- PC2 ICMP
600.356 PC2 R2 ICMP
600.357 R2 R6 ICMP
600.358 R6 PC4 ICMP
600.359 PC4 R6 ICMP
600.360 R6 R2 ICMP
600.361 R2 PC2 ICMP

Fig. 21 Enviar paquete desde PC 2 a PC 4.

Ahora ejecutamos el comando ping en la PC 3 hacia la PC 4.
En la figura 22 se ejecutó el comando ping para enviar un paquete desde la PC 3 a la PC 4, se muestra en la ventana de simulación de packet tracer esta ruta.

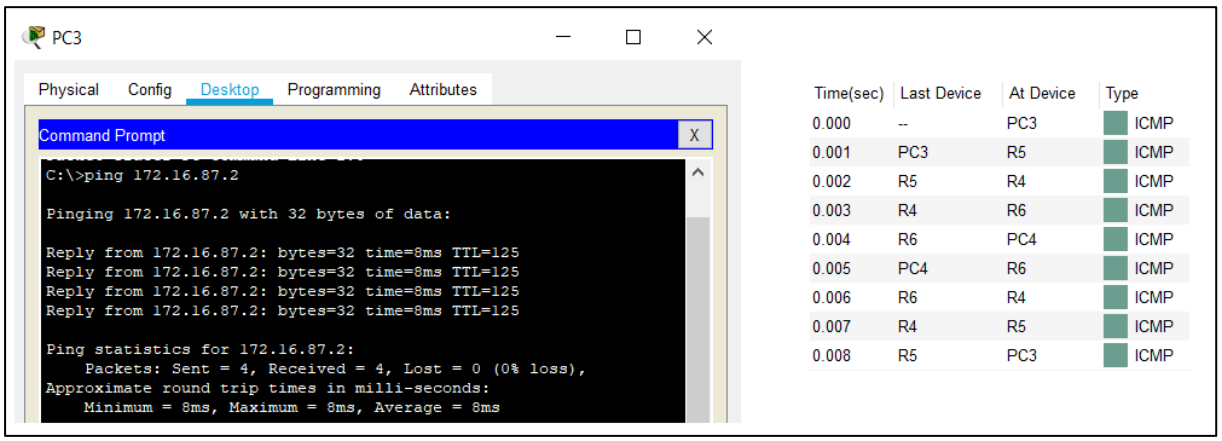
PC3
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 8ms, Maximum = 8ms, Average = 8ms
Time(sec) Last Device At Device Type
0.000 -- PC3 ICMP
0.001 PC3 R5 ICMP
0.002 R5 R4 ICMP
0.003 R4 R6 ICMP
0.004 R6 PC4 ICMP
0.005 PC4 R6 ICMP
0.006 R6 R4 ICMP
0.007 R4 R5 ICMP
0.008 R5 PC3 ICMP

Fig. 22 Enviar paquete desde PC 3 a PC 4.

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E. Observe el trayecto que sigue las interfaces de su router de trabajo los costos asociados y su ancho de banda con ***show ip ospf interfaces. Costo*****=10^8*****/BW.*** *Almacenar estos valores para su análisis posterior e informe final.*

En las figuras 23 y 24 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 1.

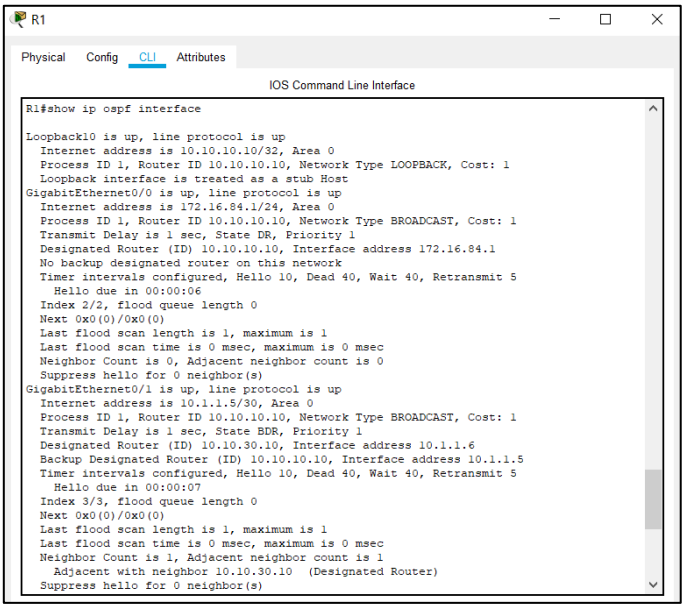
R1
Physical
Config
CLI
Attributes
IOS Command Line Interface
R1#show ip ospf interface
Loopback10 is up, line protocol is up
Internet address is 10.10.10.10/32, Area 0
Process ID 1, Router ID 10.10.10.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 172.16.84.1/24, Area 0
Process ID 1, Router ID 10.10.10.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.10.10, Interface address 172.16.84.1
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.5/30, Area 0
Process ID 1, Router ID 10.10.10.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 10.10.30.10, Interface address 10.1.1.6
Backup Designated Router (ID) 10.10.10.10, Interface address 10.1.1.5
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.30.10 (Designated Router)
Suppress hello for 0 neighbor(s)

Fig. 23 Costo asociado a la Interfaz GigabitEthernet del Router 1.

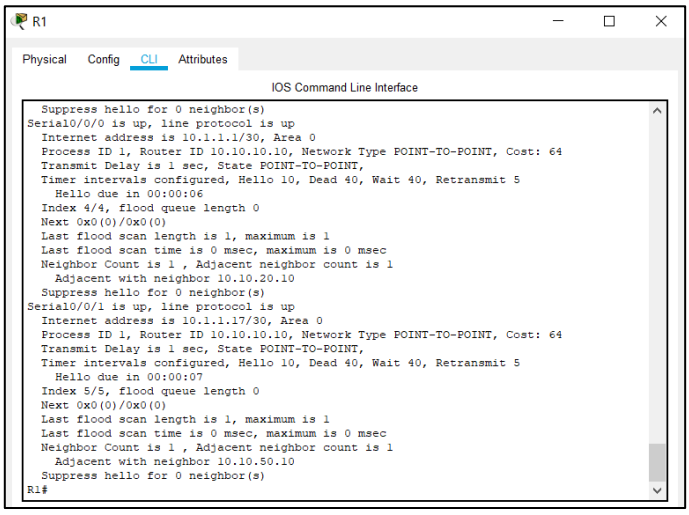
R1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.1/30, Area 0
Process ID 1, Router ID 10.10.10.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.20.10
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Internet address is 10.1.1.17/30, Area 0
Process ID 1, Router ID 10.10.10.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 5/5, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.50.10
Suppress hello for 0 neighbor(s)
R1#

Fig. 24 Costo asociado a la Interfaz Serial del Router 1.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, el costo de interfaces GigabitEthernet es de 1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

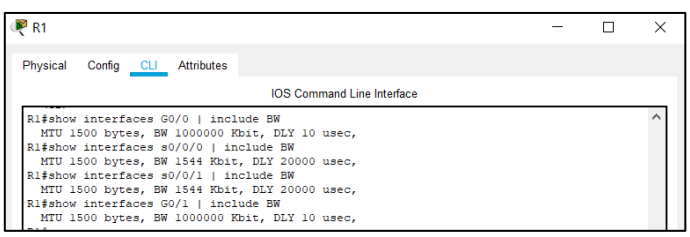
R1
Physical
Config
CLI
Attributes
IOS Command Line Interface
R1#show interfaces G0/0 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R1#show interfaces s0/0/0 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R1#show interfaces s0/0/1 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R1#show interfaces G0/1 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 25 Ancho de banda (BW) del Router 1.

Descargado por Jose Suyo (xihirel165@gomail5.com)

En las figuras 26 y 27 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 2.

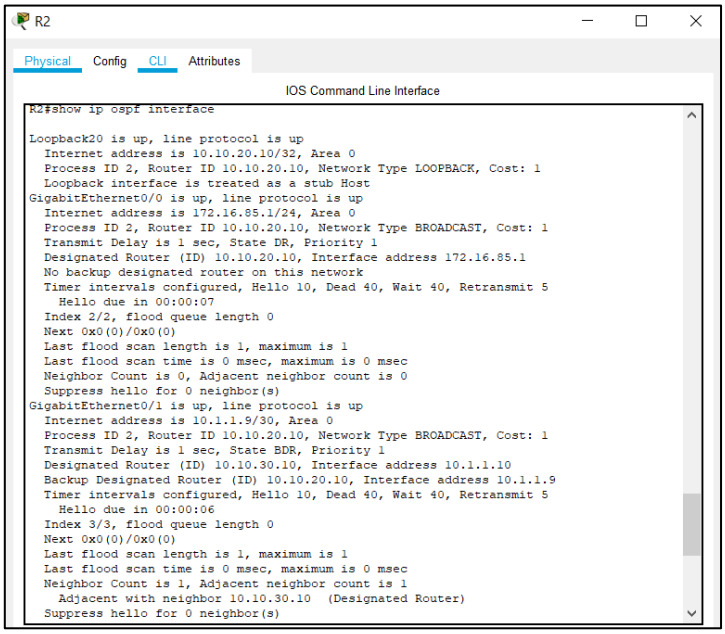
R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
R2#show ip ospf interface
Loopback20 is up, line protocol is up
Internet address is 10.10.20.10/32, Area 0
Process ID 2, Router ID 10.10.20.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 172.16.85.1/24, Area 0
Process ID 2, Router ID 10.10.20.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.20.10, Interface address 172.16.85.1
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.9/30, Area 0
Process ID 2, Router ID 10.10.20.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 10.10.30.10, Interface address 10.1.1.10
Backup Designated Router (ID) 10.10.20.10, Interface address 10.1.1.9
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.30.10 (Designated Router)
Suppress hello for 0 neighbor(s)

Fig. 26 Costo asociado a la Interfaz GigabitEthernet del Router 2.

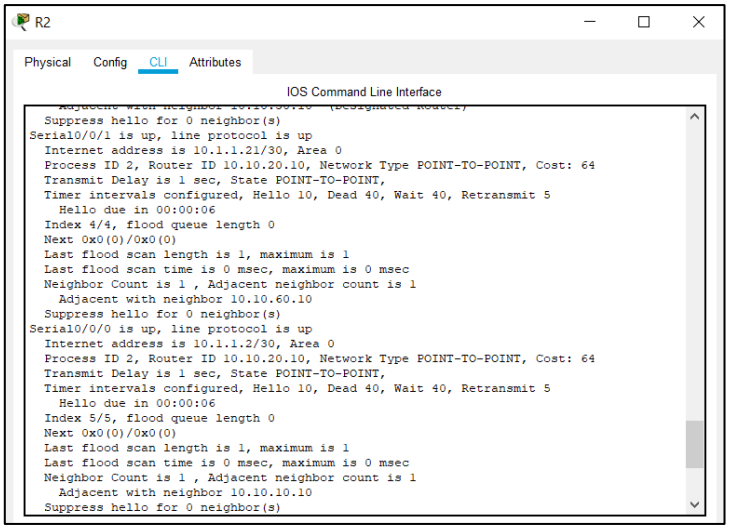
R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Internet address is 10.1.1.21/30, Area 0
Process ID 2, Router ID 10.10.20.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.60.10
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.2/30, Area 0
Process ID 2, Router ID 10.10.20.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 5/5, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.10.10
Suppress hello for 0 neighbor(s)

Fig. 27 Costo asociado a la Interfaz Serial del Router 2.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, la interfaz G0/0 del Router 2 tiene un costo de 1 al igual que la interfaz G0/1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

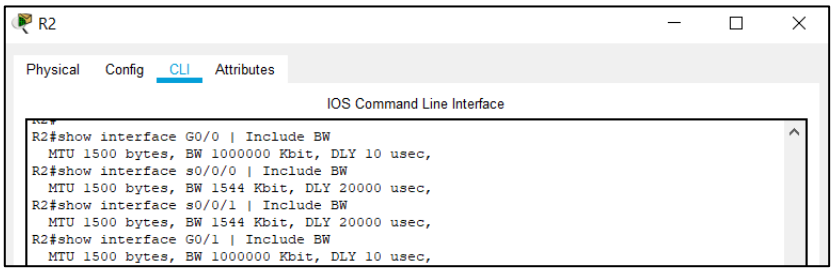
R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
R2#show interface G0/0 | Include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R2#show interface s0/0/0 | Include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R2#show interface s0/0/1 | Include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R2#show interface G0/1 | Include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 28 Ancho de banda (BW) del Router 2.

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Descargado por Jose Suyo (xihirel165@gomail5.com)

En las figuras 29 y 30 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 3.

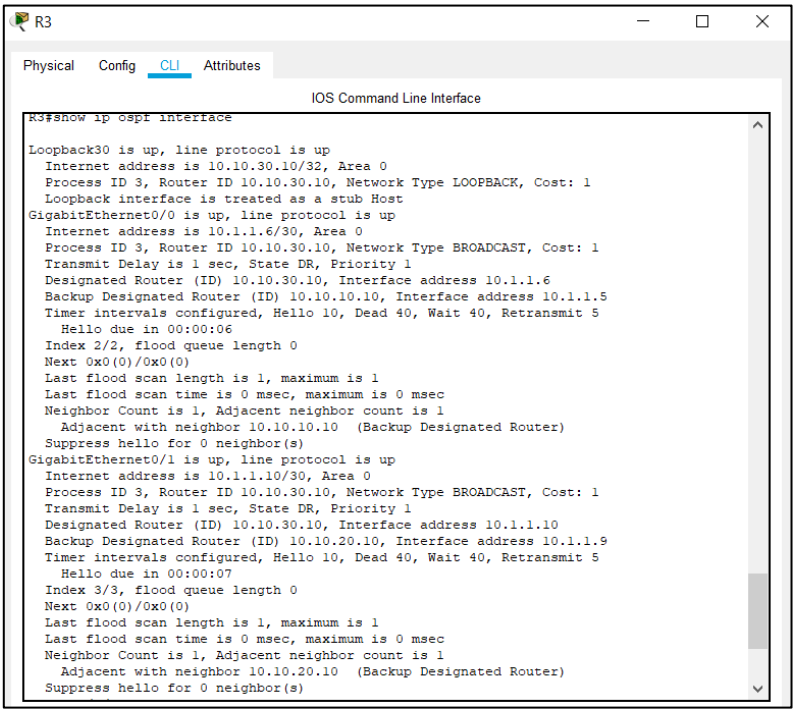
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
R3#show ip ospf interface
Loopback30 is up, line protocol is up
Internet address is 10.10.30.10/32, Area 0
Process ID 3, Router ID 10.10.30.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 10.1.1.6/30, Area 0
Process ID 3, Router ID 10.10.30.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.30.10, Interface address 10.1.1.6
Backup Designated Router (ID) 10.10.10.10, Interface address 10.1.1.5
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.10.10 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.10/30, Area 0
Process ID 3, Router ID 10.10.30.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.30.10, Interface address 10.1.1.10
Backup Designated Router (ID) 10.10.20.10, Interface address 10.1.1.9
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.20.10 (Backup Designated Router)
Suppress hello for 0 neighbor(s)

Fig. 29 Costo asociado a la Interfaz GigabitEthernet del Router 3.

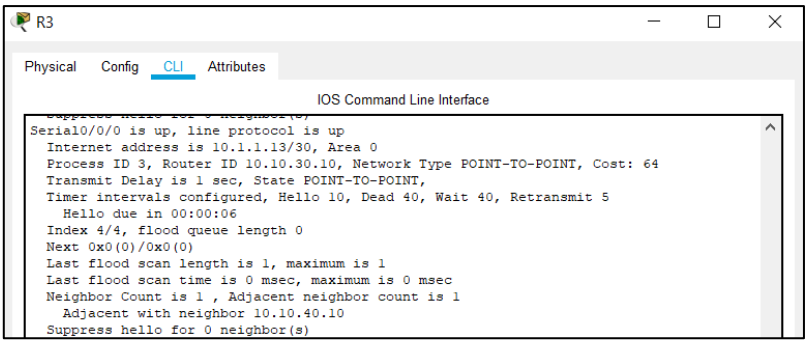
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.13/30, Area 0
Process ID 3, Router ID 10.10.30.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.40.10
Suppress hello for 0 neighbor(s)

Fig. 30 Costo asociado a la Interfaz Serial del Router 3.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, la interfaz G0/0 del Router 3 tiene un costo de 1 al igual que la interfaz G0/1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

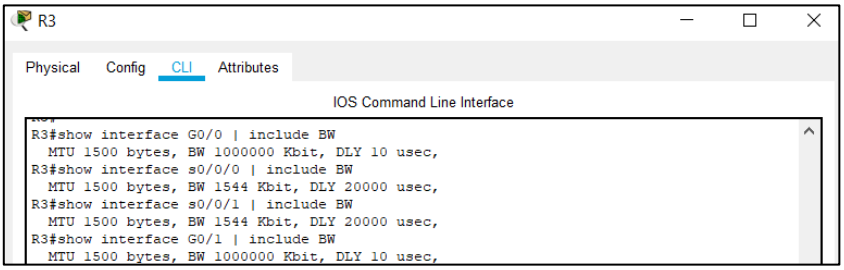
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
R3#show interface G0/0 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R3#show interface s0/0/0 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R3#show interface s0/0/1 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R3#show interface G0/1 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 31 Ancho de banda (BW) del Router 3.

Descargado por Jose Suyo (xihirel165@gomail5.com)

En las figuras 32 y 33 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 4.

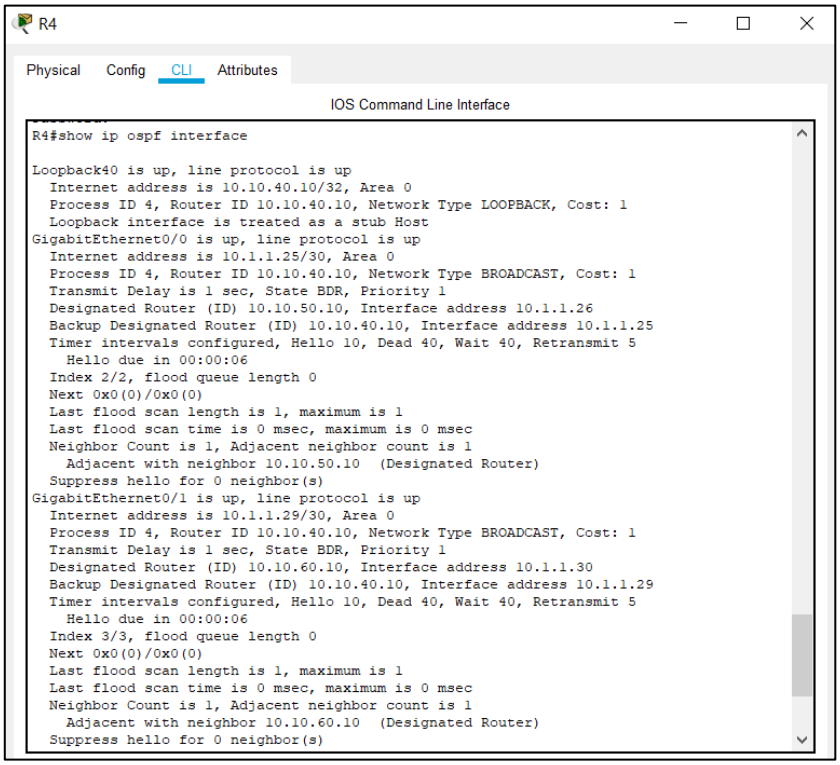
R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
R4#show ip ospf interface
Loopback40 is up, line protocol is up
Internet address is 10.10.40.10/32, Area 0
Process ID 4, Router ID 10.10.40.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 10.1.1.25/30, Area 0
Process ID 4, Router ID 10.10.40.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 10.10.50.10, Interface address 10.1.1.26
Backup Designated Router (ID) 10.10.40.10, Interface address 10.1.1.25
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.50.10 (Designated Router)
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.29/30, Area 0
Process ID 4, Router ID 10.10.40.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State BDR, Priority 1
Designated Router (ID) 10.10.60.10, Interface address 10.1.1.30
Backup Designated Router (ID) 10.10.40.10, Interface address 10.1.1.29
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.60.10 (Designated Router)
Suppress hello for 0 neighbor(s)

Fig. 32 Costo asociado a la Interfaz GigabitEthernet del Router 4.

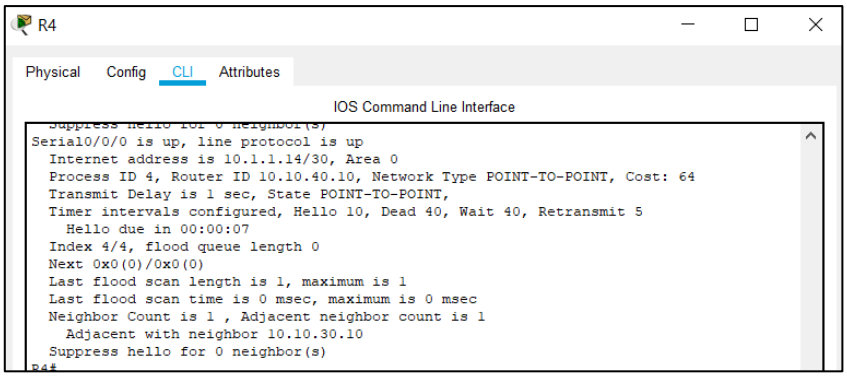
R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.14/30, Area 0
Process ID 4, Router ID 10.10.40.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.30.10
Suppress hello for 0 neighbor(s)

Fig. 33 Costo asociado a la Interfaz Serial del Router 4.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, la interfaz G0/0 del Router 4 tiene un costo de 1 al igual que la interfaz G0/1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

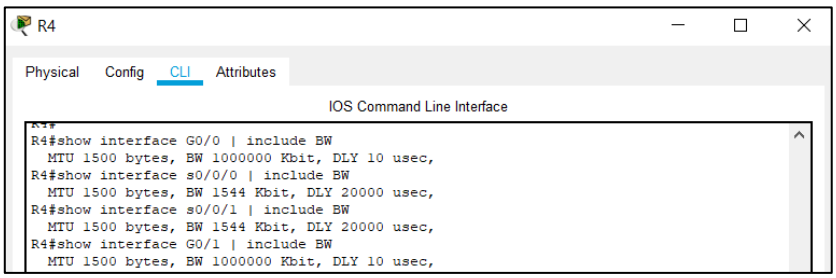
R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
R4#show interface G0/0 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R4#show interface s0/0/0 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R4#show interface s0/0/1 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R4#show interface G0/1 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 34 Ancho de banda (BW) del Router 4.

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Descargado por Jose Suyo (xihirel165@gomail5.com)

En las figuras 35 y 36 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 5.

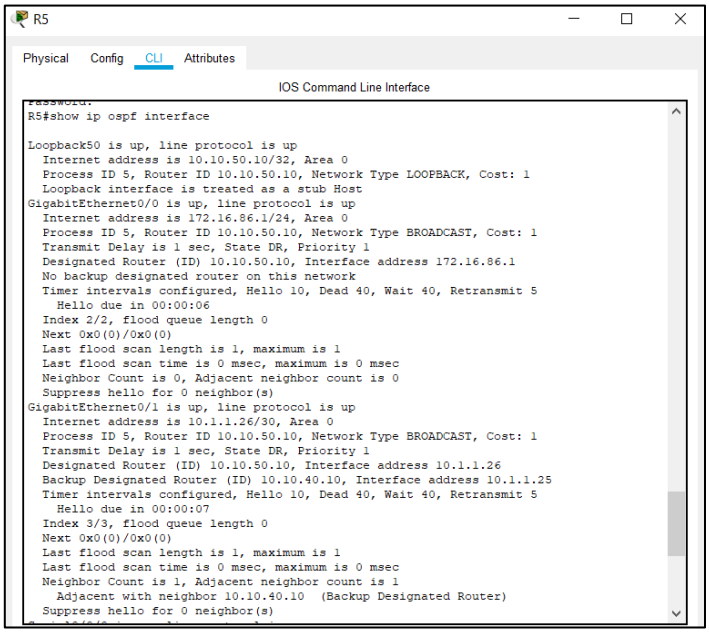
R5
Physical
Config
CLI
Attributes
IOS Command Line Interface
R5#show ip ospf interface
Loopback50 is up, line protocol is up
Internet address is 10.10.50.10/32, Area 0
Process ID 5, Router ID 10.10.50.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 172.16.86.1/24, Area 0
Process ID 5, Router ID 10.10.50.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.50.10, Interface address 172.16.86.1
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.26/30, Area 0
Process ID 5, Router ID 10.10.50.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.50.10, Interface address 10.1.1.26
Backup Designated Router (ID) 10.10.40.10, Interface address 10.1.1.25
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.40.10 (Backup Designated Router)
Suppress hello for 0 neighbor(s)

Fig. 35 Costo asociado a la Interfaz GigabitEthernet del Router 5.

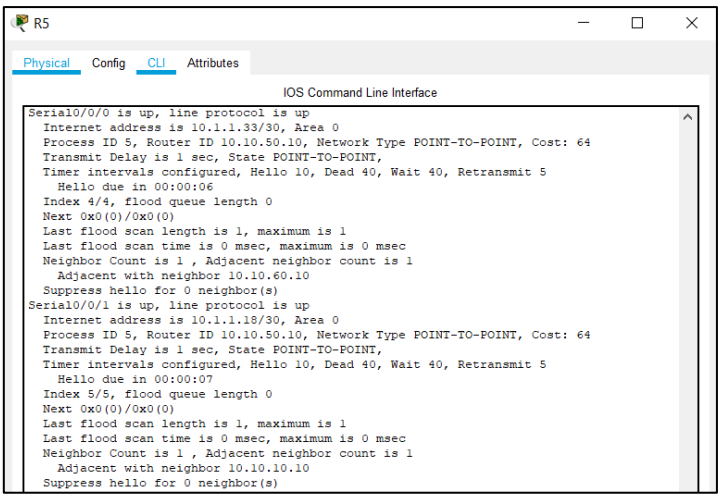
R5
Physical
Config
CLI
Attributes
IOS Command Line Interface
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.33/30, Area 0
Process ID 5, Router ID 10.10.50.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.60.10
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up
Internet address is 10.1.1.18/30, Area 0
Process ID 5, Router ID 10.10.50.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 5/5, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.10.10
Suppress hello for 0 neighbor(s)

Fig. 36 Costo asociado a la Interfaz Serial del Router 5.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, la interfaz G0/0 del Router 5 tiene un costo de 1 al igual que la interfaz G0/1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

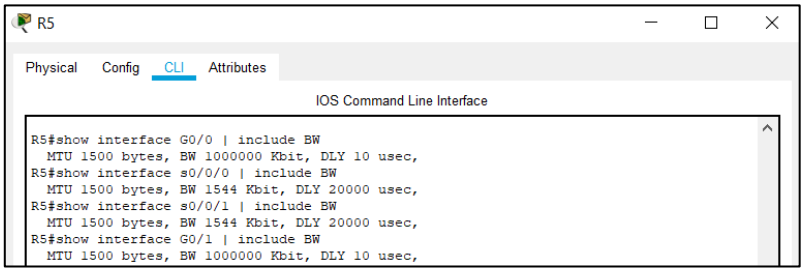
R5
Physical
Config
CLI
Attributes
IOS Command Line Interface
R5#show interface G0/0 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R5#show interface s0/0/0 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R5#show interface s0/0/1 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R5#show interface G0/1 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 37 Ancho de banda (BW) del Router 5.

Descargado por Jose Suyo (xihirel165@gomail5.com)

En las figuras 38 y 39 se observa el costo asociado a la interfaz GigabitEthernet y Serial del Router 6.

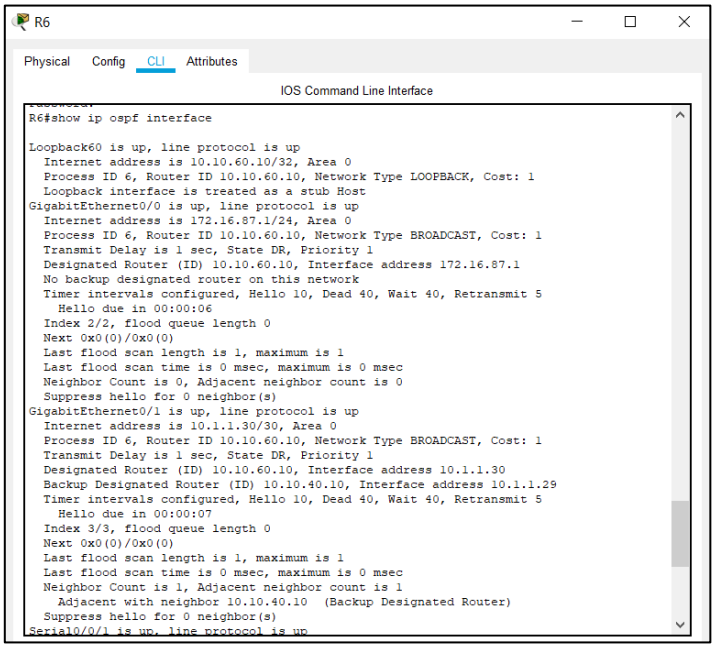
R6
Physical
Config
CLI
Attributes
IOS Command Line Interface
R6#show ip ospf interface
Loopback60 is up, line protocol is up
Internet address is 10.10.60.10/32, Area 0
Process ID 6, Router ID 10.10.60.10, Network Type LOOPBACK, Cost: 1
Loopback interface is treated as a stub Host
GigabitEthernet0/0 is up, line protocol is up
Internet address is 172.16.87.1/24, Area 0
Process ID 6, Router ID 10.10.60.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.60.10, Interface address 172.16.87.1
No backup designated router on this network
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 2/2, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 0, Adjacent neighbor count is 0
Suppress hello for 0 neighbor(s)
GigabitEthernet0/1 is up, line protocol is up
Internet address is 10.1.1.30/30, Area 0
Process ID 6, Router ID 10.10.60.10, Network Type BROADCAST, Cost: 1
Transmit Delay is 1 sec, State DR, Priority 1
Designated Router (ID) 10.10.60.10, Interface address 10.1.1.30
Backup Designated Router (ID) 10.10.40.10, Interface address 10.1.1.29
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:07
Index 3/3, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1, Adjacent neighbor count is 1
Adjacent with neighbor 10.10.40.10 (Backup Designated Router)
Suppress hello for 0 neighbor(s)
Serial0/0/1 is up, line protocol is up

Fig. 38 Costo asociado a la Interfaz GigabitEthernet del Router 6.

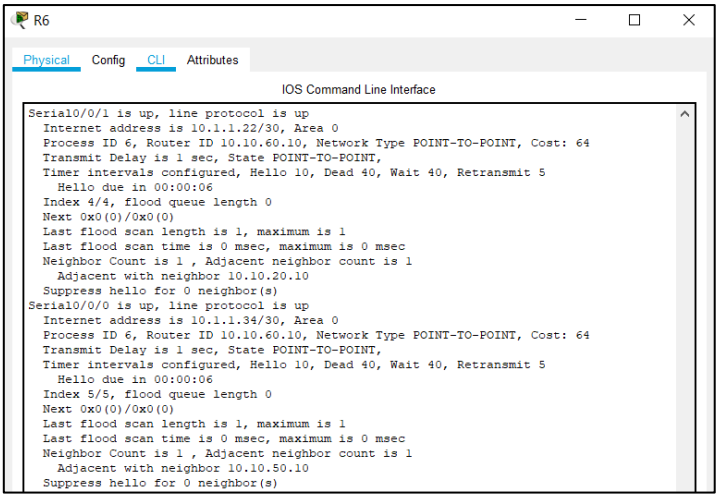
R6
Physical
Config
CLI
Attributes
IOS Command Line Interface
Serial0/0/1 is up, line protocol is up
Internet address is 10.1.1.22/30, Area 0
Process ID 6, Router ID 10.10.60.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 4/4, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.20.10
Suppress hello for 0 neighbor(s)
Serial0/0/0 is up, line protocol is up
Internet address is 10.1.1.34/30, Area 0
Process ID 6, Router ID 10.10.60.10, Network Type POINT-TO-POINT, Cost: 64
Transmit Delay is 1 sec, State POINT-TO-POINT,
Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
Hello due in 00:00:06
Index 5/5, flood queue length 0
Next 0x0(0)/0x0(0)
Last flood scan length is 1, maximum is 1
Last flood scan time is 0 msec, maximum is 0 msec
Neighbor Count is 1 , Adjacent neighbor count is 1
Adjacent with neighbor 10.10.50.10
Suppress hello for 0 neighbor(s)

Fig. 39 Costo asociado a la Interfaz Serial del Router 6.

La interfaz Loopback o virtual tiene un costo de 1 por lo que tiene un ancho de banda de 100Mbps, la interfaz G0/0 del Router 6 tiene un costo de 1 al igual que la interfaz G0/1 por lo que su BW es de 100 Mbps y en las interfaces seriales que tienen un costo de 64 por lo que su respectivo BW 1.544 Mbps.

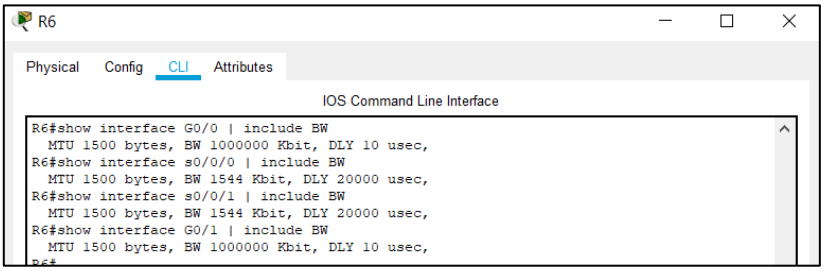
R6
Physical
Config
CLI
Attributes
IOS Command Line Interface
R6#show interface G0/0 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,
R6#show interface s0/0/0 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R6#show interface s0/0/1 | include BW
MTU 1500 bytes, BW 1544 Kbit, DLY 20000 usec,
R6#show interface G0/1 | include BW
MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec,

Fig. 40 Ancho de banda (BW) del Router 6.

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F. Observe el trayecto que sigue la información enviada desde la LAN 1 hacia las demás lANs. Modifique los trayectos, modificando el ancho de banda con el comando bandwith o directamente los costos con el comando ip ospf cost en las interfaces de los enlaces. Verifique esta nueva situación (comando tracert) y almacene la tabla de enrutamiento actualizado, para su análisis y explicación posterior e informe final.

En la figura 41 se observa que para llegar de la LAN 1 a la LAN 2 se realiza 4 saltos con un costo total de 4 (interfaz Gigabits de costo 1) a pesar de que puede realizar 3 saltos, sin embargo, este protocolo prioriza el costo menor que los saltos realizados.

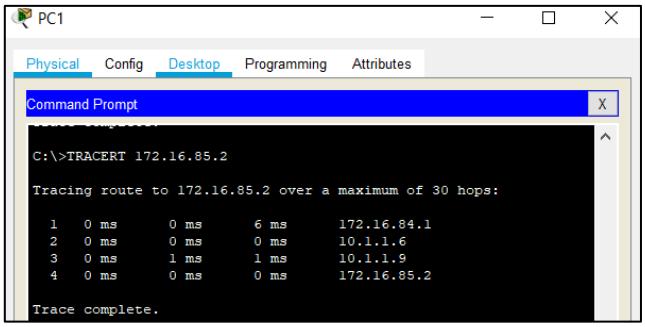

Fig. 41 Tracer del LAN 1 al LAN 2.

En la figura 42 se observa que para llegar de la LAN 1 a la LAN 3 se realiza 3 saltos con un costo total de 66 (2 interfaz Gigabits de costo 1 y una interfaz serial de costo 64) a pesar de que se puede realizar 5 saltos, sin embargo, este protocolo prioriza el costo menor que los saltos realizados.

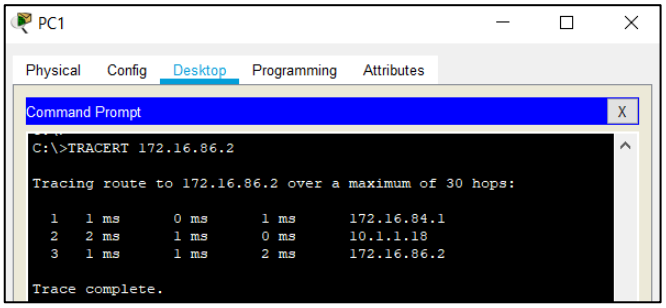

Fig. 42 Tracer del LAN 1 al LAN 3.

En la figura 42 se observa que para llegar de la LAN 1 a la LAN 4 se realiza 5 saltos con un costo total de 68 (4 interfaz Gigabits de costo 1 y una interfaz serial de costo 64) a pesar de que se puede realizar 4 saltos, sin embargo, este protocolo prioriza el costo menor que los saltos realizados.

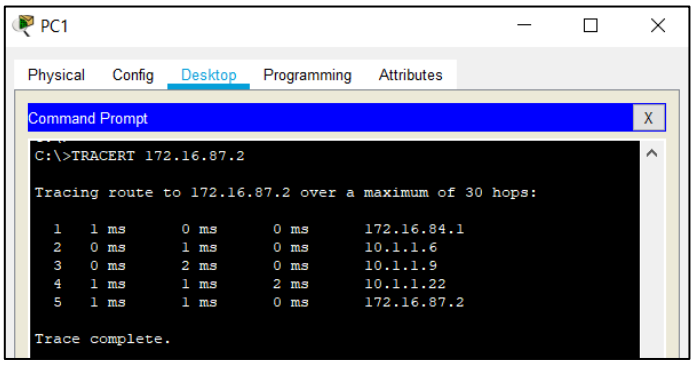
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>TRACERT 172.16.87.2
Tracing route to 172.16.87.2 over a maximum of 30 hops:
1 1 ms 0 ms 0 ms 172.16.84.1
2 0 ms 1 ms 0 ms 10.1.1.6
3 0 ms 2 ms 0 ms 10.1.1.9
4 1 ms 1 ms 2 ms 10.1.1.22
5 1 ms 1 ms 0 ms 172.16.87.2
Trace complete.

Fig. 43 Tracer del LAN 1 al LAN 4.

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G. Implemente la topología de la figura 44, en la que se simulara la interconexión de redes corporativas empleando el enrutamiento dinámico OSPFv2 multitarea.

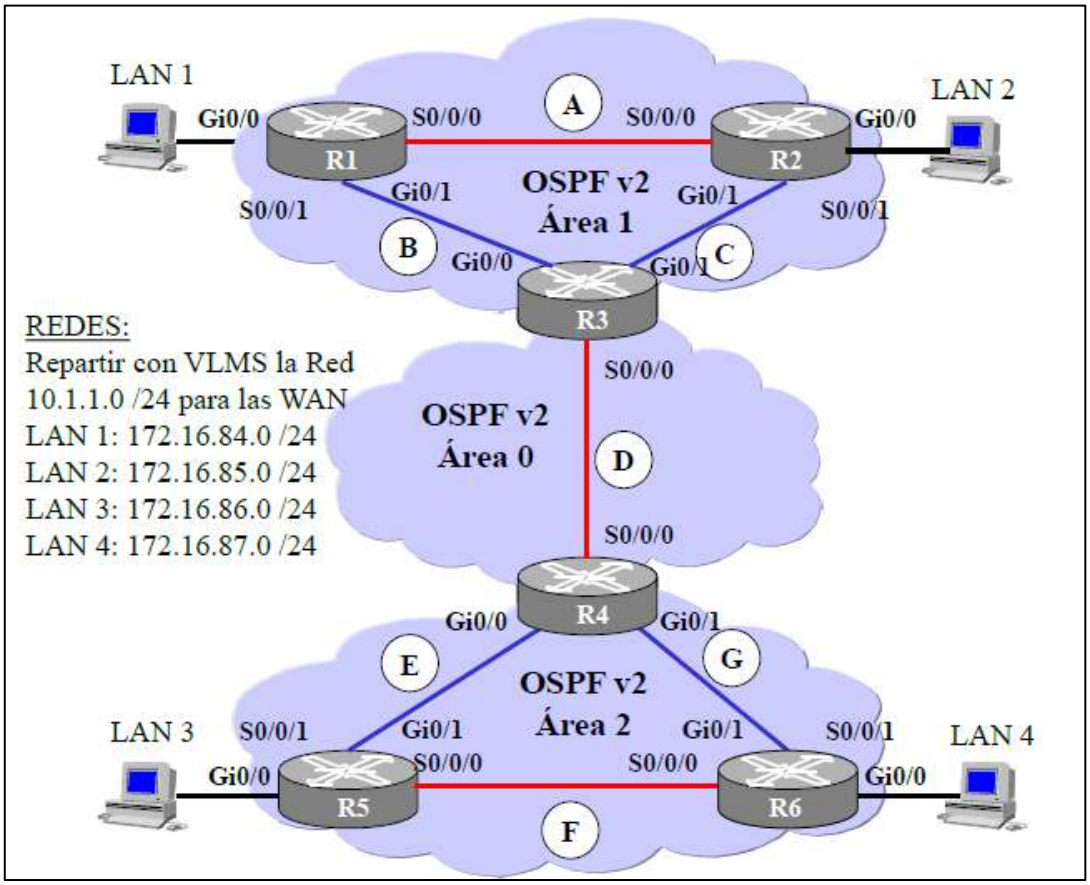

Fig. 44 Topología de la red a implementar en Cisco Packet Tracer.

Primero se repartió las direcciones de red y direcciones IP de cada red WAN usando la técnica de VLMS, para las 7 WAN que se presentan en la figura 44.

En la siguiente tabla observaremos para cada red WAN su dirección de red, dirección de broadcast, máscara de subred y las respectivas direcciones asignables.

Tabla 6 Direcciones para cada WAN

WAN	Dirección de red	Máscara	1era Dirección asignable	Última dirección asignable	Dirección de broadcast
A	10.1.1.0/30	255.255.255.252	10.1.1.1	10.1.1.2	10.1.1.3
B	10.1.1.4/30	255.255.255.252	10.1.1.5	10.1.1.6	10.1.1.7
C	10.1.1.8/30	255.255.255.252	10.1.1.9	10.1.1.10	10.1.1.11
D	10.1.1.12/30	255.255.255.252	10.1.1.13	10.1.1.14	10.1.1.15
E	10.1.1.16/30	255.255.255.252	10.1.1.17	10.1.1.18	10.1.1.19
F	10.1.1.20/30	255.255.255.252	10.1.1.21	10.1.1.22	10.1.1.23

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G	10.1.1.24/30	255.255.255.252	10.1.1.25	10.1.1.26	10.1.1.27

Las direcciones para las 4 redes LAN ya fueron dadas previamente, estas direcciones se pueden ver en la tabla 2.

Tabla 7 Dirección para cada LAN.

LAN	Dirección de red	Máscara	1era Dirección asignable
1	172.16.84.0	255.255.255.0	172.16.84.1
2	172.16.85.0	255.255.255.0	172.16.85.1
3	172.16.86.0	255.255.255.0	172.16.86.1
4	172.16.87.0	255.255.255.0	172.16.87.1

Una vez definido todas las direcciones que corresponderán tanto a las PCs como a los routers, se implementa la topología de la figura 1 en el software Packet Tracer, y después configurar a cada router y cada PC con las direcciones asignables.
La figura 2 muestra esta topología realizada en Packet Tracer con etiquetas que identifican las direcciones de las redes LAN y redes WAN.

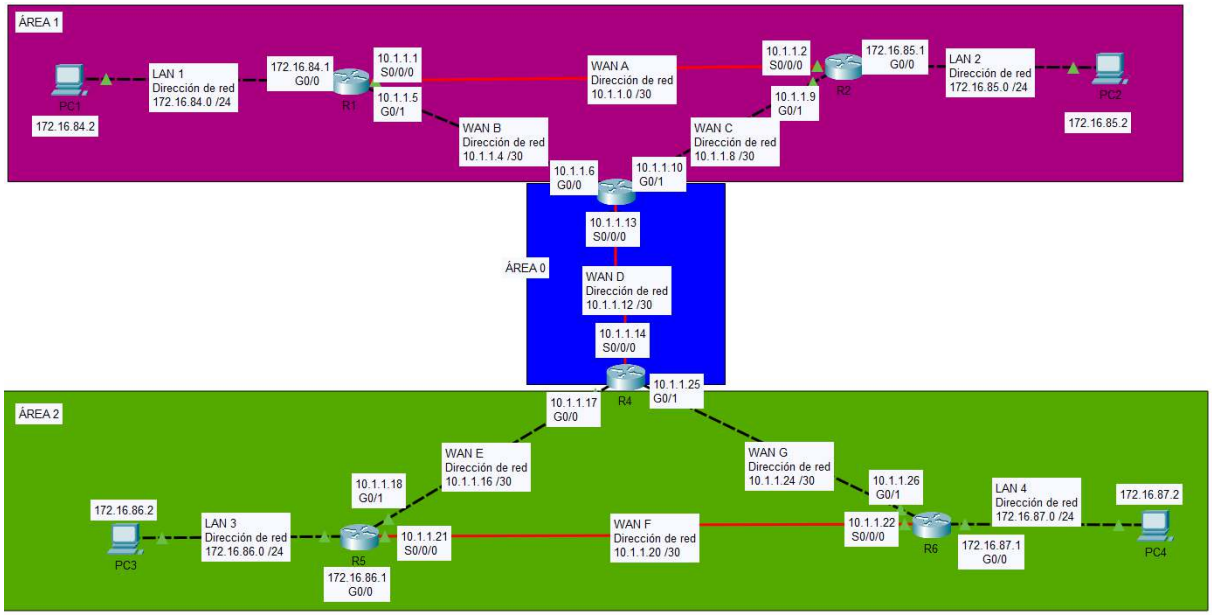

Fig. 45 Segunda Topología implementada en Packet Tracer.

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*H. Verifique la conectividad con el comando **ping** entre las redes LAN.*

Vamos a verificar la conectividad entre las redes LAN 1 y LAN 4. Para lograr esto vamos a abrir la ventana de comandos de la PC 1 con dirección IP 172.16.84.2 y enviaremos 4 paquetes de 32 bytes usando el comando ping a la PC 4 con dirección IP 172.16.87.2.

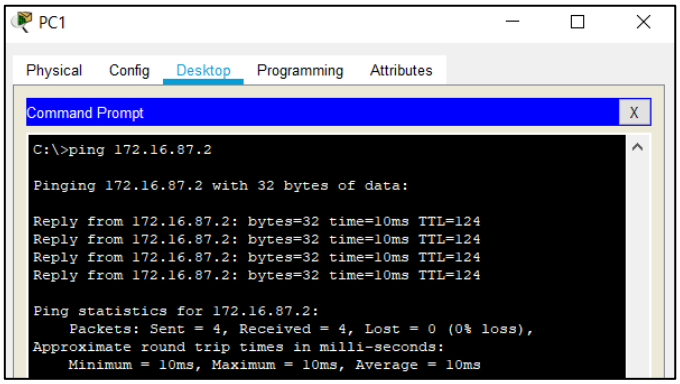
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms

Fig. 46 Ping desde la PC1 a la PC4.

En la siguiente imagen se muestra el envió de uno de los 4 paquetes, y muestra que durante el envió realiza la siguiente ruta.

- La PC 1 envía el paquete al router 1.
- El router 1 envía el paquete al router 3.
- El router 3 envía el paquete al router 4.
- El router 4 envía el paquete a la router 6.
- El router 6 envía el paquete a la PC 4.

Para la respuesta la ruta es de la siguiente manera:

- La PC 4 envía el paquete al router 6.
- El router 6 envía el paquete al router 4.
- El router 4 envía el paquete al router 3.
- El router 3 envía el paquete al router 1.
- El router 1 envía el paquete a la PC 1.

Time(sec)	Last Device	At Device	Type
0.000	--	PC1	ICMP
0.001	PC1	R1	ICMP
0.002	R1	R3	ICMP
0.003	R3	R4	ICMP
0.004	R4	R6	ICMP
0.005	R6	PC4	ICMP
0.006	PC4	R6	ICMP
0.007	R6	R4	ICMP
0.008	R4	R3	ICMP
0.009	R3	R1	ICMP
0.010	R1	PC1	ICMP

Fig. 47 Ruta del paquete de PC 1 a PC 4.

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En la figura 48 se observa que las flechas amarillas indican el request y las flechas naranjas indican el reply, y se muestran la ruta que describe el paquete.

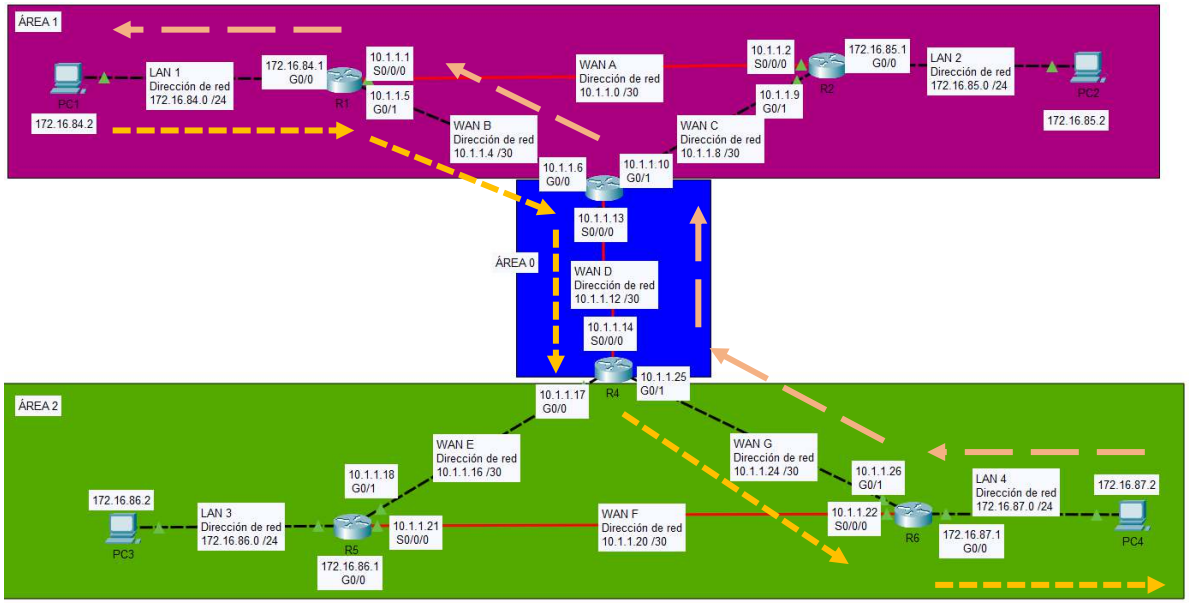

Fig. 48 Ruta que describe el paquete.

De igual manera se cumplirá cuando se hace ping desde una LAN a otra, a continuación, se muestra la ejecución de este comando de la PC 1 a las PC 2 y 3.
En la figura 49 se ejecutó el comando ping para enviar un paquete desde la PC 1 a la PC 2, se muestra en la ventana de simulación de packet tracer esta ruta.

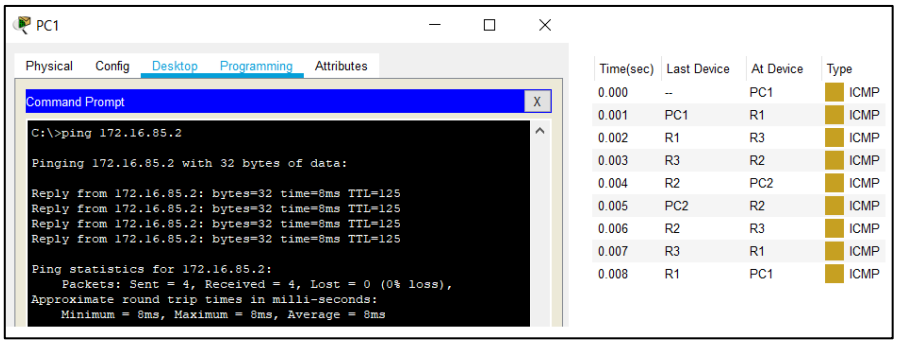
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 172.16.85.2
Pinging 172.16.85.2 with 32 bytes of data:
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Reply from 172.16.85.2: bytes=32 time=8ms TTL=125
Ping statistics for 172.16.85.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 8ms, Maximum = 8ms, Average = 8ms
Time(sec) Last Device At Device Type
0.000 -- PC1 ICMP
0.001 PC1 R1 ICMP
0.002 R1 R3 ICMP
0.003 R3 R2 ICMP
0.004 R2 PC2 ICMP
0.005 PC2 R2 ICMP
0.006 R2 R3 ICMP
0.007 R3 R1 ICMP
0.008 R1 PC1 ICMP

Fig. 49 Enviar paquete desde PC 1 a PC 2.

En la figura 50 se ejecutó el comando ping para enviar un paquete desde la PC 1 a la PC 3, se muestra en la ventana de simulación de packet tracer esta ruta.

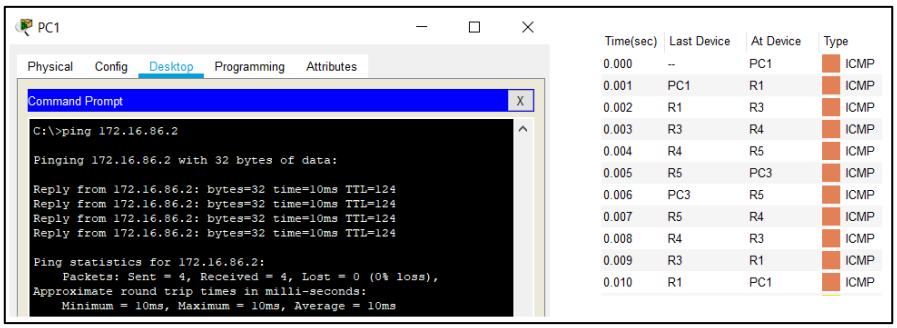
PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
C:\>ping 172.16.86.2
Pinging 172.16.86.2 with 32 bytes of data:
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.86.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms
Time(sec) Last Device At Device Type
0.000 -- PC1 ICMP
0.001 PC1 R1 ICMP
0.002 R1 R3 ICMP
0.003 R3 R4 ICMP
0.004 R4 R5 ICMP
0.005 R5 PC3 ICMP
0.006 PC3 R5 ICMP
0.007 R5 R4 ICMP
0.008 R4 R3 ICMP
0.009 R3 R1 ICMP
0.010 R1 PC1 ICMP

Fig. 50 Enviar paquete desde PC 1 a PC 3.

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Ahora ejecutamos el comando ping en la PC 2 hacia la PC 3 y PC 4.
En la figura 51 se ejecutó el comando ping para enviar un paquete desde la PC 2 a la PC 3, se muestra en la ventana de simulación de packet tracer esta ruta.

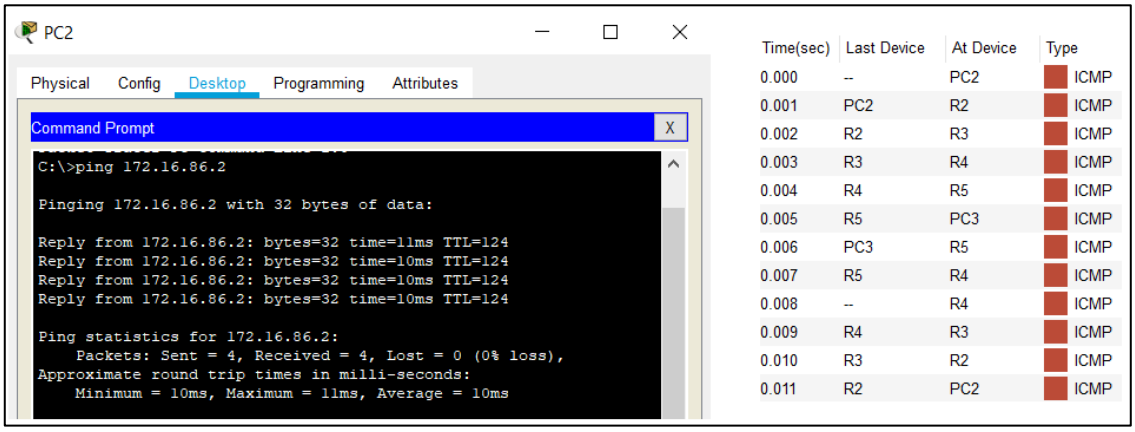
PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.86.2
Pinging 172.16.86.2 with 32 bytes of data:
Reply from 172.16.86.2: bytes=32 time=11ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Reply from 172.16.86.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.86.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 11ms, Average = 10ms
Time(sec) Last Device At Device Type
0.000 -- PC2 ICMP
0.001 PC2 R2 ICMP
0.002 R2 R3 ICMP
0.003 R3 R4 ICMP
0.004 R4 R5 ICMP
0.005 R5 PC3 ICMP
0.006 PC3 R5 ICMP
0.007 R5 R4 ICMP
0.008 -- R4 ICMP
0.009 R4 R3 ICMP
0.010 R3 R2 ICMP
0.011 R2 PC2 ICMP

Fig. 51 Enviar paquete desde PC 2 a PC 3.

En la figura 52 se ejecutó el comando ping para enviar un paquete desde la PC 2 a la PC 4, se muestra en la ventana de simulación de packet tracer esta ruta.

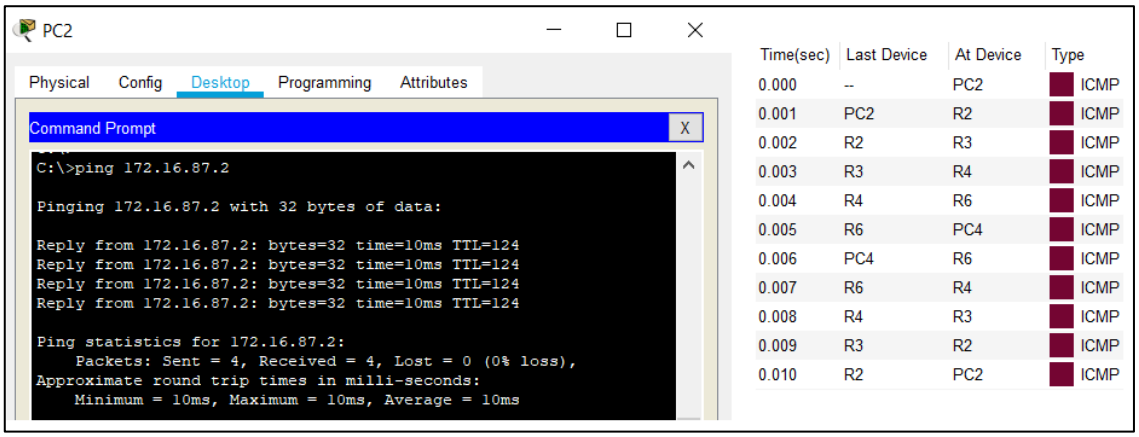
PC2
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Reply from 172.16.87.2: bytes=32 time=10ms TTL=124
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 10ms, Maximum = 10ms, Average = 10ms
Time(sec) Last Device At Device Type
0.000 -- PC2 ICMP
0.001 PC2 R2 ICMP
0.002 R2 R3 ICMP
0.003 R3 R4 ICMP
0.004 R4 R6 ICMP
0.005 R6 PC4 ICMP
0.006 PC4 R6 ICMP
0.007 R6 R4 ICMP
0.008 R4 R3 ICMP
0.009 R3 R2 ICMP
0.010 R2 PC2 ICMP

Fig. 52 Enviar paquete desde PC 2 a PC 4.

Ahora ejecutamos el comando ping en la PC 3 hacia la PC 4.
En la figura 22 se ejecutó el comando ping para enviar un paquete desde la PC 3 a la PC 4, se muestra en la ventana de simulación de packet tracer esta ruta.

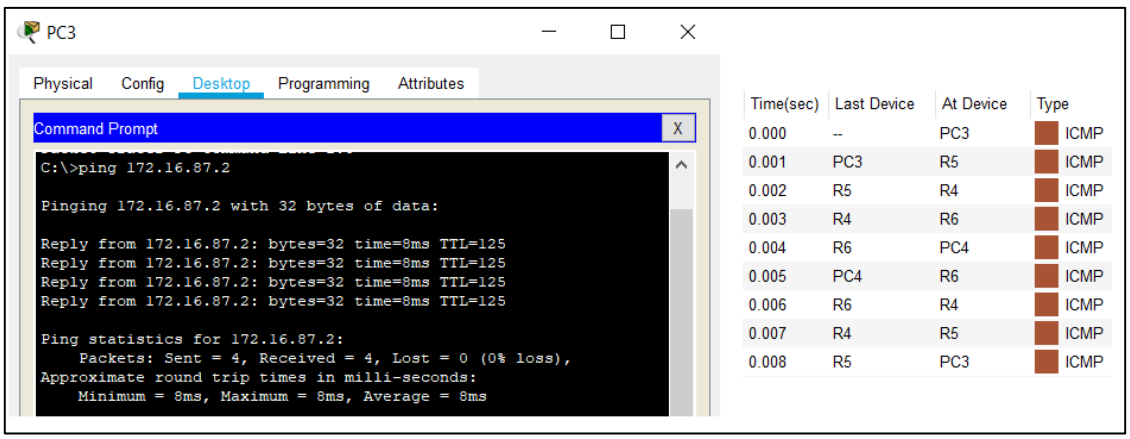
PC3
Physical Config Desktop Programming Attributes
Command Prompt
C:\>ping 172.16.87.2
Pinging 172.16.87.2 with 32 bytes of data:
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Reply from 172.16.87.2: bytes=32 time=8ms TTL=125
Ping statistics for 172.16.87.2:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 8ms, Maximum = 8ms, Average = 8ms
Time(sec) Last Device At Device Type
0.000 -- PC3 ICMP
0.001 PC3 R5 ICMP
0.002 R5 R4 ICMP
0.003 R4 R6 ICMP
0.004 R6 PC4 ICMP
0.005 PC4 R6 ICMP
0.006 R6 R4 ICMP
0.007 R4 R5 ICMP
0.008 R5 PC3 ICMP

Fig. 53 Enviar paquete desde PC 3 a PC 4.

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I. Analice los mensajes de actualización de estado de enlace LSA intra e interáreas.

A continuación, se observa en las siguientes figuras las tablas de enrutamiento con todas las áreas para los routers.

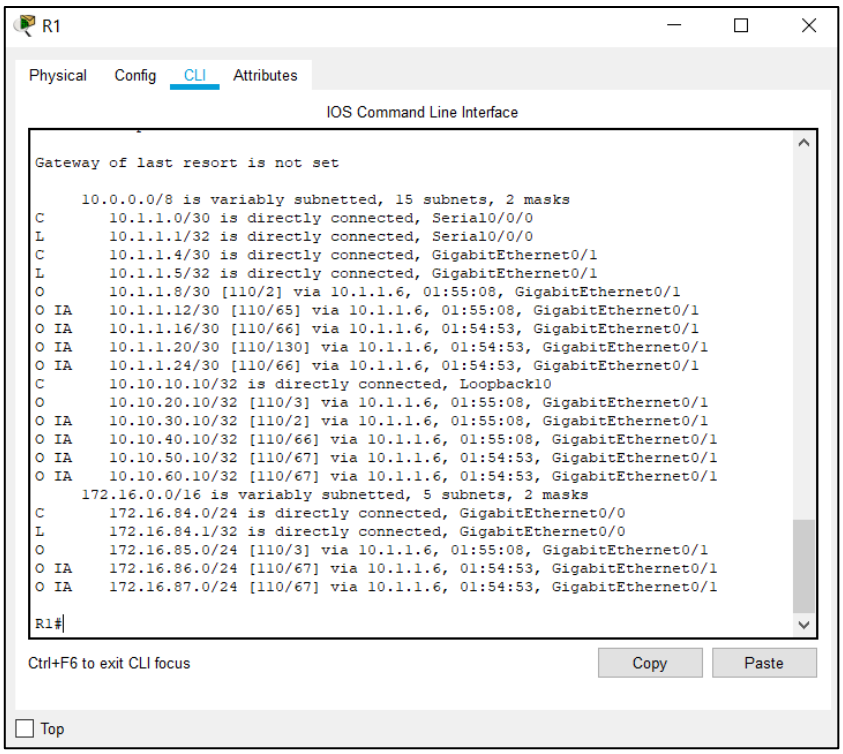
R1
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 15 subnets, 2 masks
C 10.1.1.0/30 is directly connected, Serial0/0/0
L 10.1.1.1/32 is directly connected, Serial0/0/0
C 10.1.1.4/30 is directly connected, GigabitEthernet0/1
L 10.1.1.5/32 is directly connected, GigabitEthernet0/1
O 10.1.1.8/30 [110/2] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 10.1.1.12/30 [110/65] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 10.1.1.16/30 [110/66] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
O IA 10.1.1.20/30 [110/130] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
O IA 10.1.1.24/30 [110/66] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
C 10.10.10.10/32 is directly connected, Loopback10
O 10.10.20.10/32 [110/3] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 10.10.30.10/32 [110/2] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 10.10.40.10/32 [110/66] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 10.10.50.10/32 [110/67] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
O IA 10.10.60.10/32 [110/67] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
C 172.16.84.0/24 is directly connected, GigabitEthernet0/0
L 172.16.84.1/32 is directly connected, GigabitEthernet0/0
O 172.16.85.0/24 [110/3] via 10.1.1.6, 01:55:08, GigabitEthernet0/1
O IA 172.16.86.0/24 [110/67] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
O IA 172.16.87.0/24 [110/67] via 10.1.1.6, 01:54:53, GigabitEthernet0/1
R1#
Ctrl+F6 to exit CLI focus
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Fig. 54 Intra-áreas e interáreas del Router 1.

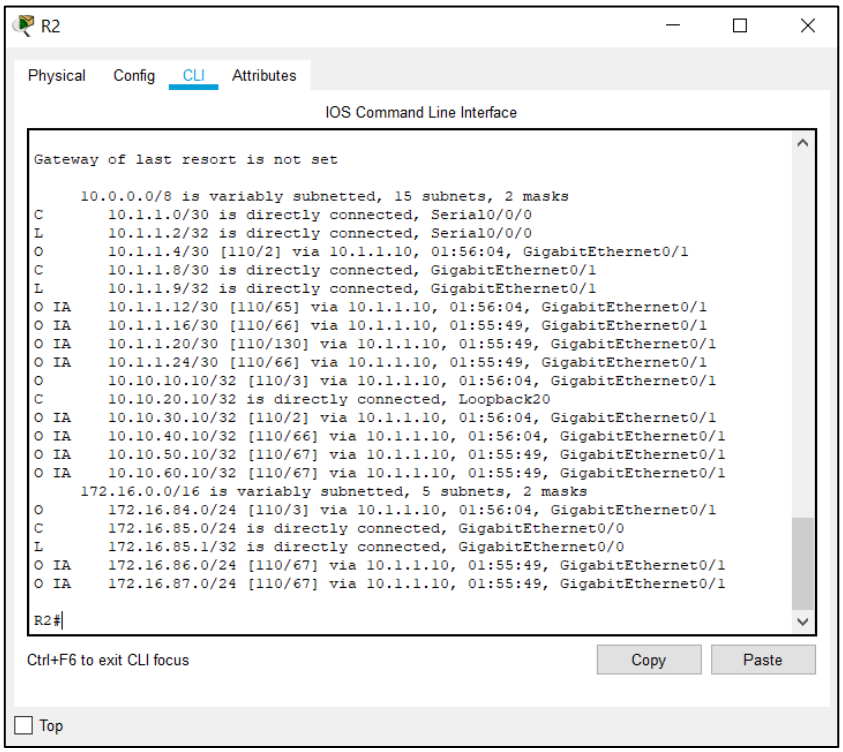
R2
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 15 subnets, 2 masks
C 10.1.1.0/30 is directly connected, Serial0/0/0
L 10.1.1.2/32 is directly connected, Serial0/0/0
O 10.1.1.4/30 [110/2] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
C 10.1.1.8/30 is directly connected, GigabitEthernet0/1
L 10.1.1.9/32 is directly connected, GigabitEthernet0/1
O IA 10.1.1.12/30 [110/65] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
O IA 10.1.1.16/30 [110/66] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
O IA 10.1.1.20/30 [110/130] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
O IA 10.1.1.24/30 [110/66] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
O 10.10.10.10/32 [110/3] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
C 10.10.20.10/32 is directly connected, Loopback20
O IA 10.10.30.10/32 [110/2] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
O IA 10.10.40.10/32 [110/66] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
O IA 10.10.50.10/32 [110/67] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
O IA 10.10.60.10/32 [110/67] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O 172.16.84.0/24 [110/3] via 10.1.1.10, 01:56:04, GigabitEthernet0/1
C 172.16.85.0/24 is directly connected, GigabitEthernet0/0
L 172.16.85.1/32 is directly connected, GigabitEthernet0/0
O IA 172.16.86.0/24 [110/67] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
O IA 172.16.87.0/24 [110/67] via 10.1.1.10, 01:55:49, GigabitEthernet0/1
R2#
Ctrl+F6 to exit CLI focus
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Fig. 55 Intra-áreas e interáreas del Router 2.

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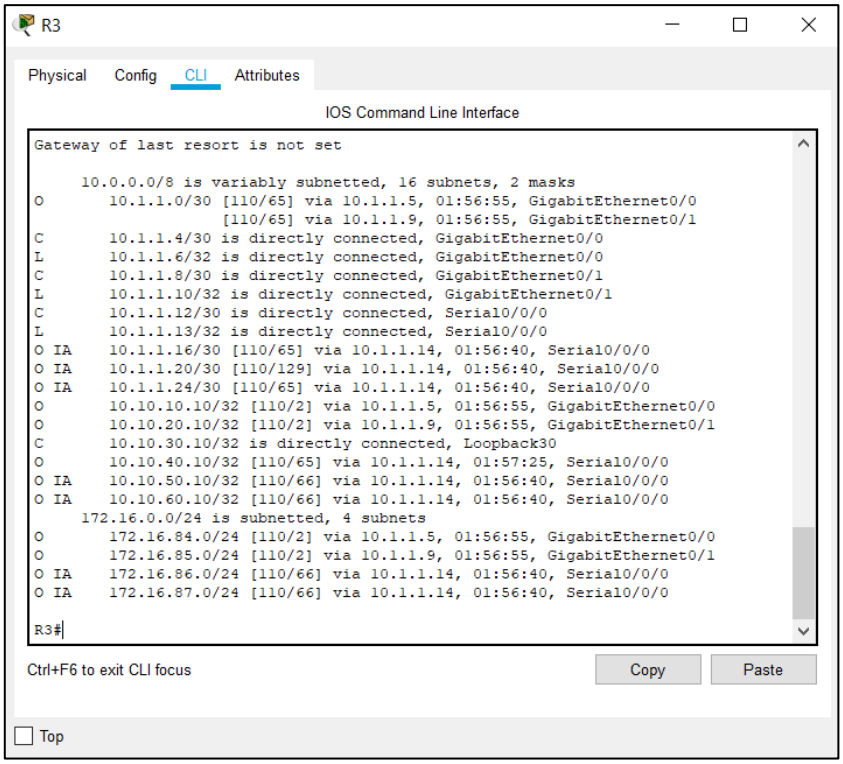
R3
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 16 subnets, 2 masks
O 10.1.1.0/30 [110/65] via 10.1.1.5, 01:56:55, GigabitEthernet0/0
[110/65] via 10.1.1.9, 01:56:55, GigabitEthernet0/1
C 10.1.1.4/30 is directly connected, GigabitEthernet0/0
L 10.1.1.6/32 is directly connected, GigabitEthernet0/0
C 10.1.1.8/30 is directly connected, GigabitEthernet0/1
L 10.1.1.10/32 is directly connected, GigabitEthernet0/1
C 10.1.1.12/30 is directly connected, Serial0/0/0
L 10.1.1.13/32 is directly connected, Serial0/0/0
O IA 10.1.1.16/30 [110/65] via 10.1.1.14, 01:56:40, Serial0/0/0
O IA 10.1.1.20/30 [110/129] via 10.1.1.14, 01:56:40, Serial0/0/0
O IA 10.1.1.24/30 [110/65] via 10.1.1.14, 01:56:40, Serial0/0/0
O 10.10.10.10/32 [110/2] via 10.1.1.5, 01:56:55, GigabitEthernet0/0
O 10.10.20.10/32 [110/2] via 10.1.1.9, 01:56:55, GigabitEthernet0/1
C 10.10.30.10/32 is directly connected, Loopback30
O 10.10.40.10/32 [110/65] via 10.1.1.14, 01:57:25, Serial0/0/0
O IA 10.10.50.10/32 [110/66] via 10.1.1.14, 01:56:40, Serial0/0/0
O IA 10.10.60.10/32 [110/66] via 10.1.1.14, 01:56:40, Serial0/0/0
172.16.0.0/24 is subnetted, 4 subnets
O 172.16.84.0/24 [110/2] via 10.1.1.5, 01:56:55, GigabitEthernet0/0
O 172.16.85.0/24 [110/2] via 10.1.1.9, 01:56:55, GigabitEthernet0/1
O IA 172.16.86.0/24 [110/66] via 10.1.1.14, 01:56:40, Serial0/0/0
O IA 172.16.87.0/24 [110/66] via 10.1.1.14, 01:56:40, Serial0/0/0
R3#
Ctrl+F6 to exit CLI focus
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Fig. 56 Intra-áreas e interáreas del Router 3.

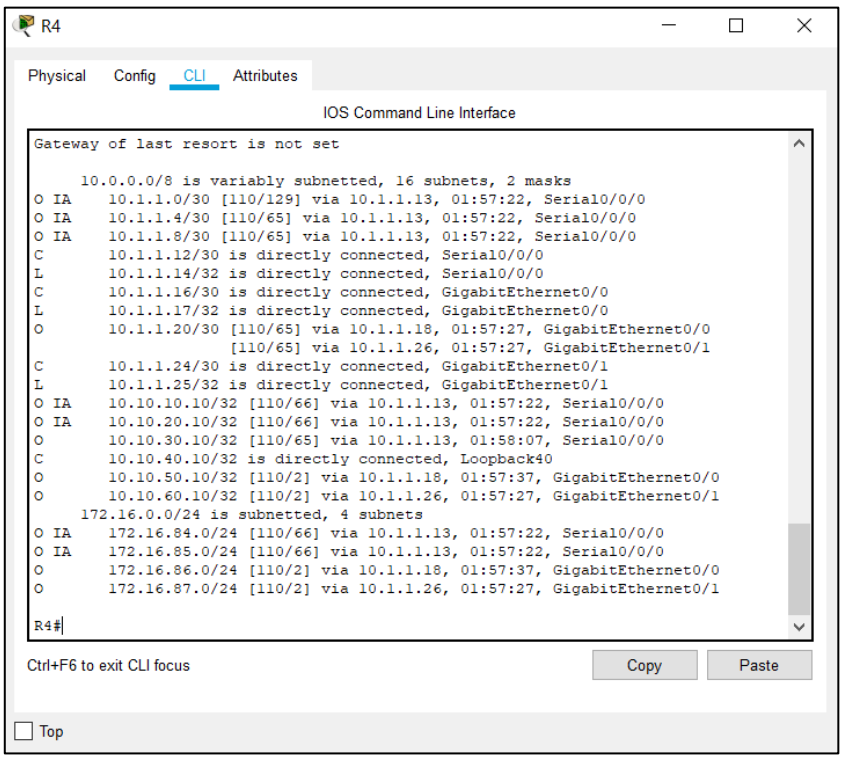
R4
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 16 subnets, 2 masks
O IA 10.1.1.0/30 [110/129] via 10.1.1.13, 01:57:22, Serial0/0/0
O IA 10.1.1.4/30 [110/65] via 10.1.1.13, 01:57:22, Serial0/0/0
O IA 10.1.1.8/30 [110/65] via 10.1.1.13, 01:57:22, Serial0/0/0
C 10.1.1.12/30 is directly connected, Serial0/0/0
L 10.1.1.14/32 is directly connected, Serial0/0/0
C 10.1.1.16/30 is directly connected, GigabitEthernet0/0
L 10.1.1.17/32 is directly connected, GigabitEthernet0/0
O 10.1.1.20/30 [110/65] via 10.1.1.18, 01:57:27, GigabitEthernet0/0
[110/65] via 10.1.1.26, 01:57:27, GigabitEthernet0/1
C 10.1.1.24/30 is directly connected, GigabitEthernet0/1
L 10.1.1.25/32 is directly connected, GigabitEthernet0/1
O IA 10.10.10.10/32 [110/66] via 10.1.1.13, 01:57:22, Serial0/0/0
O IA 10.10.20.10/32 [110/66] via 10.1.1.13, 01:57:22, Serial0/0/0
O 10.10.30.10/32 [110/65] via 10.1.1.13, 01:58:07, Serial0/0/0
C 10.10.40.10/32 is directly connected, Loopback40
O 10.10.50.10/32 [110/2] via 10.1.1.18, 01:57:37, GigabitEthernet0/0
O 10.10.60.10/32 [110/2] via 10.1.1.26, 01:57:27, GigabitEthernet0/1
172.16.0.0/24 is subnetted, 4 subnets
O IA 172.16.84.0/24 [110/66] via 10.1.1.13, 01:57:22, Serial0/0/0
O IA 172.16.85.0/24 [110/66] via 10.1.1.13, 01:57:22, Serial0/0/0
O 172.16.86.0/24 [110/2] via 10.1.1.18, 01:57:37, GigabitEthernet0/0
O 172.16.87.0/24 [110/2] via 10.1.1.26, 01:57:27, GigabitEthernet0/1
R4#
Ctrl+F6 to exit CLI focus
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Fig. 57 Intra-áreas e interáreas del Router 4.

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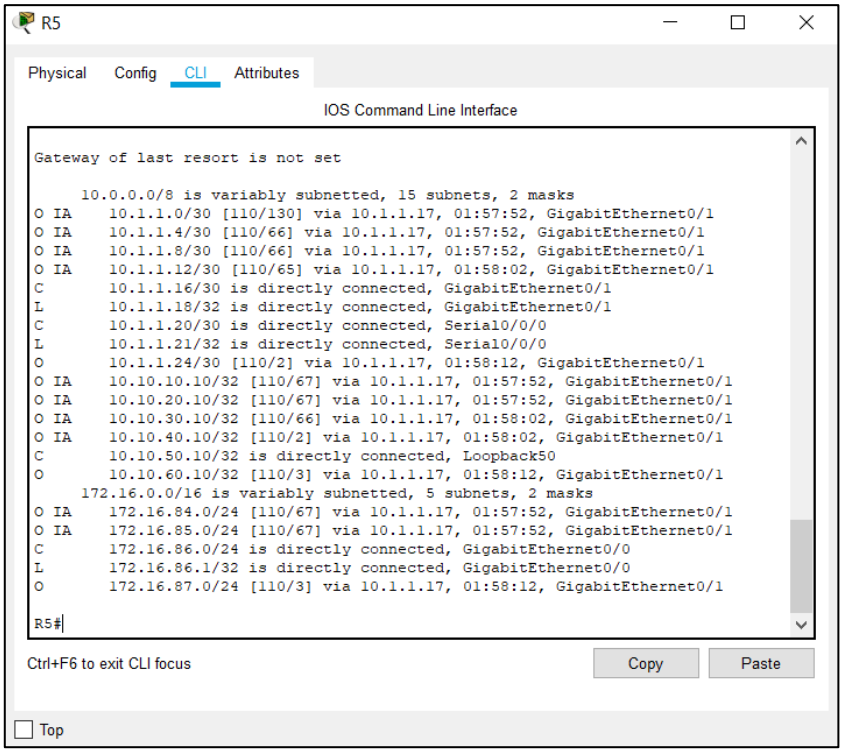
R5
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 15 subnets, 2 masks
O IA 10.1.1.0/30 [110/130] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 10.1.1.4/30 [110/66] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 10.1.1.8/30 [110/66] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 10.1.1.12/30 [110/65] via 10.1.1.17, 01:58:02, GigabitEthernet0/1
C 10.1.1.16/30 is directly connected, GigabitEthernet0/1
L 10.1.1.18/32 is directly connected, GigabitEthernet0/1
C 10.1.1.20/30 is directly connected, Serial0/0/0
L 10.1.1.21/32 is directly connected, Serial0/0/0
O 10.1.1.24/30 [110/2] via 10.1.1.17, 01:58:12, GigabitEthernet0/1
O IA 10.10.10.10/32 [110/67] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 10.10.20.10/32 [110/67] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 10.10.30.10/32 [110/66] via 10.1.1.17, 01:58:02, GigabitEthernet0/1
O IA 10.10.40.10/32 [110/2] via 10.1.1.17, 01:58:02, GigabitEthernet0/1
C 10.10.50.10/32 is directly connected, Loopback50
O 10.10.60.10/32 [110/3] via 10.1.1.17, 01:58:12, GigabitEthernet0/1
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O IA 172.16.84.0/24 [110/67] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
O IA 172.16.85.0/24 [110/67] via 10.1.1.17, 01:57:52, GigabitEthernet0/1
C 172.16.86.0/24 is directly connected, GigabitEthernet0/0
L 172.16.86.1/32 is directly connected, GigabitEthernet0/0
O 172.16.87.0/24 [110/3] via 10.1.1.17, 01:58:12, GigabitEthernet0/1
R5#
Ctrl+F6 to exit CLI focus
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Fig. 58 Intra-áreas e interáreas del Router 5.

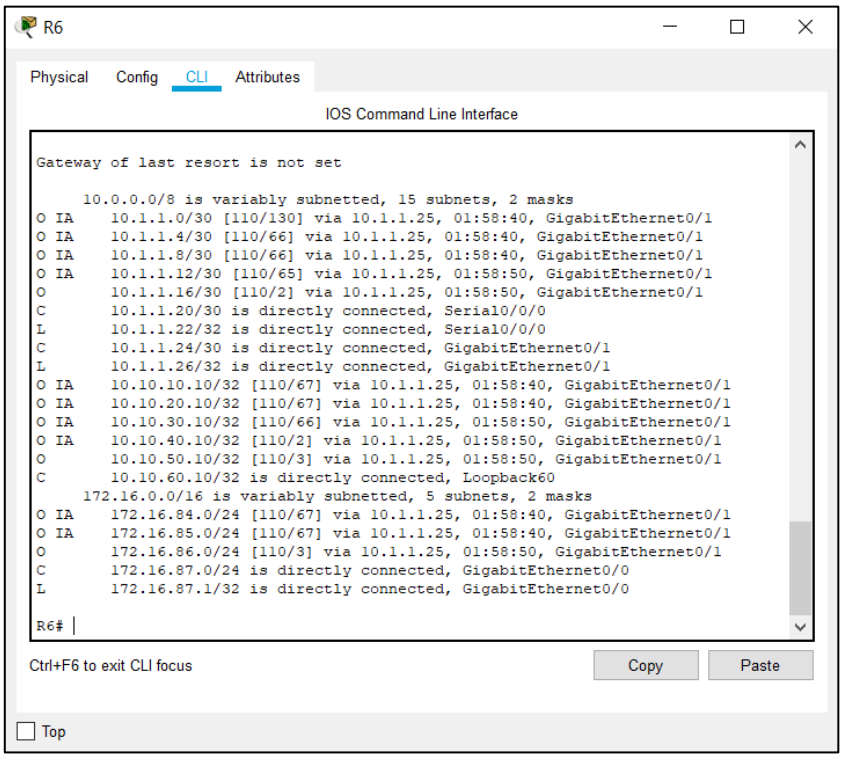
R6
Physical
Config
CLI
Attributes
IOS Command Line Interface
Gateway of last resort is not set
10.0.0.0/8 is variably subnetted, 15 subnets, 2 masks
O IA 10.1.1.0/30 [110/130] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 10.1.1.4/30 [110/66] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 10.1.1.8/30 [110/66] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 10.1.1.12/30 [110/65] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
O 10.1.1.16/30 [110/2] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
C 10.1.1.20/30 is directly connected, Serial0/0/0
L 10.1.1.22/32 is directly connected, Serial0/0/0
C 10.1.1.24/30 is directly connected, GigabitEthernet0/1
L 10.1.1.26/32 is directly connected, GigabitEthernet0/1
O IA 10.10.10.10/32 [110/67] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 10.10.20.10/32 [110/67] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 10.10.30.10/32 [110/66] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
O IA 10.10.40.10/32 [110/2] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
O 10.10.50.10/32 [110/3] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
C 10.10.60.10/32 is directly connected, Loopback60
172.16.0.0/16 is variably subnetted, 5 subnets, 2 masks
O IA 172.16.84.0/24 [110/67] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O IA 172.16.85.0/24 [110/67] via 10.1.1.25, 01:58:40, GigabitEthernet0/1
O 172.16.86.0/24 [110/3] via 10.1.1.25, 01:58:50, GigabitEthernet0/1
C 172.16.87.0/24 is directly connected, GigabitEthernet0/0
L 172.16.87.1/32 is directly connected, GigabitEthernet0/0
R6#
Ctrl+F6 to exit CLI focus
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Fig. 59 Intra-áreas e interáreas del Router 6.

Descargado por Jose Suyo (xihirel165@gomail5.com)

IV. INFORME FINAL

A. Desarrolle los protocolos de enrutamiento dinámico OSPF v2.

OSPF es un protocolo de enrutamiento sin clase y de estado del enlace, cuya versión actual para IPv4 es la OSPFv2 descrita en la RFC 2328. Entre sus características básicas habría que destacar las siguientes:

- Sus mensajes se encapsulan en un paquete IP con indicador de protocolo 89.
- La dirección de destino se establece para una de dos direcciones multicast: 224.0.0.5 ó 224.0.0.6. Si el paquete OSPF se encapsula en una trama de Ethernet, la dirección MAC de destino es también una dirección multicast: 01- 00-5E-00-00-05 o 01-00-5E-00-00-06.

Tiene asignada una distancia administrativa de 110

Existen cinco tipos de paquetes OSPF:

- Paquete Hello. Se utiliza para mantener activa la conexión OSPF con otros routers adyacentes
- Paquete DBD (DataBase Description). Contiene información de la base de datos del router que lo emite acerca del estado de los enlaces locales a este.
- Paquete LSR (Link-State Request). Es una solicitud de información sobre cualquier entrada de la base de datos de estado del enlace.
- Paquete LSU (Link-State Update). Es una respuesta a las peticiones LSR y contiene diferentes tipos de notificaciones sobre el estado del enlace, LSA (Link-State Advertisement).
- Paquete LSAck (Link-State acknowledgment). Es un acuse de recibo de un paquete LSU.

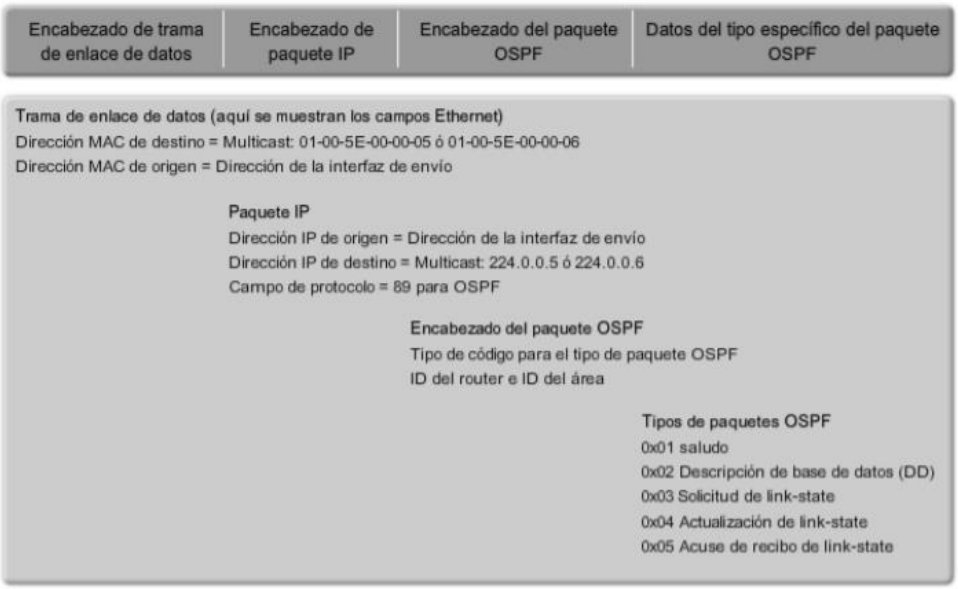
Encabezado de trama de enlace de datos
Encabezado de paquete IP
Encabezado del paquete OSPF
Datos del tipo específico del paquete OSPF
Trama de enlace de datos (aquí se muestran los campos Ethernet)
Dirección MAC de destino = Multicast: 01-00-5E-00-00-05 ó 01-00-5E-00-00-06
Dirección MAC de origen = Dirección de la interfaz de envío
Paquete IP
Dirección IP de origen = Dirección de la interfaz de envío
Dirección IP de destino = Multicast: 224.0.0.5 ó 224.0.0.6
Campo de protocolo = 89 para OSPF
Encabezado del paquete OSPF
Tipo de código para el tipo de paquete OSPF
ID del router e ID del área
Tipos de paquetes OSPF
0x01 saludo
0x02 Descripción de base de datos (DD)
0x03 Solicitud de link-state
0x04 Actualización de link-state
0x05 Acuse de recibo de link-state

Fig. 60 Formato mensaje OSPF.

Cada router OSPF mantiene una base de datos de link-state que contiene las LSA recibidas por parte de todos los demás routers. Una vez que un router recibió todas las LSA y creó su base de datos de link-state local, OSPF utiliza el algoritmo SPF (primero el camino más corto, Shortest Path First) de Dijkstra para crear un árbol SPF. El árbol SPF luego se utiliza para completar la tabla de enrutamiento IP con las mejores rutas para cada red. Esto implica que cada router mantiene un árbol propio y que no tiene porqué ser similar al de los routers del mismo dominio de enrutamiento.

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El proceso de activación y configuración de OSPF requiere los siguientes pasos en cada router:

1. Activación del proceso asignándole un identificador propio que sólo tiene significado local al router

2. Enumeración de las redes conectadas que formarán parte en el proceso de enrutamiento, indicando para cada una de ellas

a. La dirección de red
b. La máscara, en formato complementado a las máscaras de subred
c. Un identificador de área OSPD. Número entero que coincidirá en todos los routers del área de enrutamiento que compartan información sobre el estado de los enlaces.

En OSPF cada router tiene que tener una identificación propia e inequívoca que coincide, en el caso de los routers de Cisco, con el siguiente orden de precedencia:

1. La dirección IP configurada expresamente con tal fin (comando routerid).

2. Si no se configura expresamente, la dirección IP más alta de cualquier de sus interfaces de loopbak (son interfaces software activadas en cada router con el propósito de simular otras redes no existentes físicamente).

3. Si no se ha configurado ninguna interfaz de loopbak, la dirección IP más alta de cualquiera de sus interfaces físicas activas.

El coste OSPF de una ruta es un valor entero que se obtiene sumando los costes individuales de cada uno de los enlaces que forman parte de la ruta. El coste individual de un enlace en los routers de Cisco tiene un valor de referencia de 108 por defecto.

Tipo de interfaz	10^8/bps = Costo
Fast Ethernet y más rápida	10^8/100 000 000 bps = 1
Ethernet	10^8/10 000 000 bps = 10
E1	10^8/2 048 000 bps = 48
T1	10^8/1 544 000 bps = 64
120 kbps	10^8/128 000 bps = 781
64 kbps	10^8/64 000 bps = 1562
56 kbps	10^8/56 000 bps = 1785

Fig. 61 Valores del costo de los distintos tipos de enlace en los Routers.

B. Desarrolle los protocolos de enrutamiento dinámico RIPv1 y RIPv2.

Se ha presentado en las paginas anteriores. Como se puede observar en las imágenes, se ha realizado la configuración de cada router con la interfaz a la que corresponde cada red LAN y WAN, nos da información el show run sobre la memoria que está siendo ocupada, la configuración del loopback e interfaces y el protocolo OSPF que se ha utilizado con la wilcard respectiva.

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V. CONCLUSIONES

1). En la primera topología se puso en práctica subneterear usando la técnica VLMS clase A para una red que constaba con 9 redes WAN. Las direcciones de red de las redes LAN ya estaban definidas.

2). En la segunda topología se puso en práctica subneterear usando la técnica VLMS clase A para una red que constaba con 9 redes WAN. Las direcciones de red de las redes LAN ya estaban definidas.

3). Se vio la utilidad de realizar el enrutamiento o encaminamiento dinámico OSPF, particularmente la versión 2, en el software Packet tracer.

4). Se aprendió y analizo de manera exhaustiva las configuraciones que se aplicaban a cada router por el enrutamiento dinámico OSPF v2 con el comando sh run (nos muestra la dirección de cada interface, como también el enrutamiento que se está dando) y el comando sh ip route (nos muestra la tabla de enrutamiento de un router específico y los saltos que el paquete debe dar para llegar a una red determinada).

5). Se verifico de igual manera la conectividad entre las PCs de cada red LAN con el comando ping y se explicó de manera detallada la ruta que el paquete sigue.

6). El comando tracert determinA que para que llegue de la LAN 1 a la LAN 4.

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